

JOB ORDER CONTRACT JOC TECHNICAL SPECIFICATIONS VOLUME III

FOR:

**MEDCOM SUPPORT TEAM
FORT WORTH**

(UPB localized to Fort Lewis – WA)



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PREPARED BY:



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DIVISION 01 GENERAL CONDITIONS



SECTION 01200 WARRANTY OF CONSTRUCTION ZERO ACCIDENTS INDEX

1.0 WARRANTY OF CONSTRUCTION (APR 1984):

1.1 In Addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 1.10 below, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workman-ship performed by the Contractor or any subcontractor or supplier at any tier.

1.2 This Warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

1.3 The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of-

1.3.1 The Contractor's failure to conform to contract requirements; or

1.3.2 Any defect of equipment, material, workmanship, or design furnished.

1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

1.5 The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

1.6 If the Contractor fails to remedy any failure, defect, or damage within a time as specified in paragraph: WARRANTY SERVICE CALLS after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

1.7 With Respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

1.7.1 Obtain all warranties that would be given in normal commercial practice;

1.7.2 Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer, and

1.7.3 Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

1.8 In the Event the Contractor's warranty under paragraph 1.2 above has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

1.9 Unless a Defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

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1.10 This Warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

1.11 Defects in Design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government. (Based on FAR 52.246-21)

2.0 WARRANTY SERVICE CALLS: The Contractor shall furnish to the Contracting Officer the names of local service representatives and/or Contractors that are available for warranty service calls and who will respond to a call within the time periods as follows: 4 hours for heating, air-conditioning, refrigeration, air supply and distribution, and critical electrical service systems and food service equipment, and 24 hours for all other systems. The names, addresses, and telephone numbers for day, night, weekend, and holiday service responses shall be furnished to the Contracting Officer and also posted at a conspicuous location in each mechanical and electrical room or close to the unit.



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DIVISION 02 SITE WORK



SECTION 02012 STANDARD PENETRATION TESTS

1.0 DESCRIPTION OF WORK: This specification covers core drilling and borings for subsurface investigation of soils.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Auger Borings: ASTM D 1452.

3.2 Soil Samples: ASTM D 1586, ASTM D 1587.

3.3 Rock Cores: ASTM D 2113, Size BX and NX.

3.4 Bearing Capacity: ASTM D 1194.

3.5 Soils Classification: ASTM D 2487, D 2488, MIL-STD-619.

3.6 Boring Logs: Boring report shall include, but not be limited to, a boring location plan locating and numbering boring and boring logs. Log of borings shall have boring number; date of start and finish of boring; rig type, job number and name; sample number, depth, and type; depth of strata changes, soil description and classification, surface elevation, depth of boring, and depth of water table.

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SECTION 02075 CONCRETE CORE DRILLING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of equipment and labor for core drilling of existing concrete. Procedures shall be in accordance with the equipment manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used)

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Equipment shall be of shot-drill or diamond-drill type and shall be acceptable to the Contracting Officer. Shot drilling shall be used on horizontal surfaces only.

3.1.2 Location and Size of Cores shall be as directed by the Contracting Officer.

3.2 Core Drilling:

3.2.1 Drilling shall be performed in a neat manner providing a smooth, clean hole perpendicular to the surface.

3.2.2 Equipment shall be rigidly affixed to the surface to prevent drifting or misalignment of the hole.

3.2.3 Work shall be planned and executed so that dust and rubble are held to a minimum.

3.2.4 Surrounding Surfaces, Material, and Equipment shall be protected from damage from dust, water, and flying debris.

3.3 Test Samples:

3.3.1 Where Cores from Drilling are to be used for testing of existing concrete, the resulting core shall meet the requirements of ASTM C 42.

3.3.2 Test Cores shall be taken at locations as directed by the Contracting Officer.



SECTION 02080 ASBESTOS REMOVAL AND DISPOSAL

1.0 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. References to these publications in the text will be by basic designation only. State and Local laws and regulations shall also apply.

1.1 U.S. Government Code of Federal Regulations (CFR):

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

40 CFR 61 National Emission Standards for Hazardous Air Pollutants, Subpart A General Provisions

40 CFR 61 National Emission Standards for Hazardous Air Pollutants, Subpart M National Emission Standard for Asbestos

40 CFR 241 Guidelines for the Land Disposal of Solid Wastes

40 CFR 257 Criteria for Classification of Solid Waste Disposal Facilities and Practices

1.2 American National Standards Institute (ANSI) Publications:

Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Systems

Z88.2 Practices for Respiratory Protection

1.3 National Institute of Occupational Safety and Health (NIOSH):

Manual of Analytical Methods, 2nd Ed., Vol. 1, Physical and Chemical Analysis Methods (P&CAM):

Method 239 Asbestos Fibers in Air

Method 7400 Fibers (N1, 3rd Ed., Vol. 1)

1.4 Underwriters' Laboratories, Inc., (UL):

586 Test Performance of High Efficiency, Particulate, Air Filter Units

2.0 GENERAL REQUIREMENTS: This specification covers the removal and disposal of asbestos materials performed under this contract.

2.1 Work Required: Asbestos containing materials (ACM) present within and upon the structures, materials, and equipment to be altered, demolished, or repaired shall be removed and disposed of prior to demolition, alteration, or repair of the structures, materials, and equipment involved.

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2.1.1 Locations: Asbestos containing materials shall be removed from the structures, materials, and equipment to be demolished, altered, or repaired, and from all other site locations where directed. Asbestos materials to be removed shall be as identified in the appropriate "Asbestos Sampling Report" provided by the Government or as shown on the drawings or written descriptions which form a part of the construction documents. This shall not relieve the Contractor from the responsibility of notifying the Contracting Officer or his representative of the discovery of suspected additional asbestos during the course of contract performance. Upon notification by the Contractor of suspected additional ACM, the Contracting Officer shall be responsible for the verification of existence and extent of additional work. Should the suspected material prove not to be ACM, the Contracting Officer shall so notify the Contractor.

2.1.2 Debris: All debris located within the project limits for asbestos removal and disposal work shall be considered as containing, or having been contaminated with asbestos, and shall be treated, handled, removed and disposed of in accordance with applicable regulations. Any miscellaneous debris located outside of the requested work area which is determined to contain asbestos shall also be disposed of in accordance with the applicable regulations.

2.1.3 Structures, Materials, and Equipment Surfaces: Interior building surfaces, including supporting structure surfaces or equipment shall be considered as contaminated with asbestos containing dust. Surfaces shall be cleaned in accordance with the regulations prior to demolition, alteration, or repair of the structures, materials, and equipment.

3.0 CONTRACTOR COMPLIANCE AND RESPONSIBILITY:

3.1 Compliance: The Contractor shall perform asbestos removal and disposal operations in compliance with all Federal, State, and Local laws, regulations, standards, codes and these specifications, governing asbestos removal and disposal. Any other work required in conjunction with such removal and disposal shall also comply with all Federal, State, and Local laws, regulations, codes, and these specifications. In the event of a conflict between the requirements of the regulations and the requirements contained in these specifications, the more stringent requirements shall govern.

3.2 Responsibility: It shall be the responsibility of the Contractor to visit and investigate the site; review all applicable drawings and specifications; to review all applicable and available "Asbestos Sampling Reports"; to assess the actual amount of asbestos present; and become thoroughly familiar with conditions, and the relative difficulty thereof, which are present and will affect a complete asbestos removal and disposal operation.

3.2.1 The Contractor is responsible for supplying all labor, material, equipment, services, insurances, and all incidentals which are necessary or required to perform the work in accordance with the applicable regulations and these specifications.

3.2.2 The Contractor shall have a Certified Industrial Hygienist (CIH) or his representative at the job site throughout all phases of the work.

4.0 GOVERNMENT RESPONSIBILITY:

4.1 Asbestos Sampling Report: When available, the Contracting Officer or his representative shall provide the Contractor with an Asbestos Sampling Report based on samples taken and analyzed at a testing laboratory. This report shall constitute a representation of what is believed to be a complete identification of the asbestos containing material associated with a facility or site, and be definitive to the degree that the Contractor may use the report to determine initial project requirements. While the report should identify all known asbestos at the facility or site, it is not a certification of total scope identification. The Contractor



shall remain responsible for notification to the Contracting Officer of any additional suspected asbestos containing materials discovered during the execution of the Contract.

4.2 Monitoring: The Government may employ a Certified Industrial Hygienist (independent of that required to be employed by the Contractor) to monitor air quality, project procedures, and to help ensure the Contractor is in compliance with applicable Federal, State, and Local regulations.

5.0 **CONTRACTOR QUALIFICATIONS AND CERTIFICATION:** Unless otherwise stated, at least five (5) days prior to the start of any asbestos removal work, the Contractor shall provide the following submittals to the Contracting Officer or his representative:

5.1 Certifications: That the principals of the firm actually performing the work and all employees involved in asbestos removal and disposal operations are familiar with the following:

- a. The U.S. Environmental Protection Agency's Regulations for Asbestos--40 CFR 61, Subpart M.
- b. The U.S. Department of Labor OSHA Asbestos Regulations--29 CFR 1910 and 29 CFR 1926.
- c. State and local regulations pertaining to asbestos removal, abatement, hauling, and disposal.

The Contractor shall also certify that all employees who are involved in asbestos work have received the information and training required by 29 CFR 1926.58(k) (3) and that the Contractor has complied with all other State and Local requirements.

5.2 Licenses: Evidence shall be submitted that the Contractor is licensed to perform asbestos removal projects in the jurisdiction in which the project is located.

5.3 Notifications: Prior to starting any asbestos removal work, the Contractor shall attend a pre-construction meeting. The time and place of the meeting shall be designated by the Contracting Officer. At that meeting the Contractor shall provide a detailed written account(s) of the following:

- a. Proposed work schedule for all operations involving asbestos.
- b. Overview of site preparation plans and the proposed project containment strategy. A complete detailed asbestos removal plan shall be submitted at least three (3) days prior to start of asbestos removal work.
- c. Submit for approval of the Contracting Officer the name, address, and telephone number of laboratories which will perform the test analysis throughout the project. The laboratories shall have participated in at least six (6) rounds of the EPA asbestos bulk sample quality assurance program and currently be proficient in the AIHA Administred PAT program for air samples.
- d. The name of the Certified Industrial Hygienist (CIH) to be assigned to the project by the Contractor. The CIH shall meet the qualification requirements of a "Competent Person" as stated in 29 CFR 1926.58(b).

5.4 Asbestos Inventory: Prior to any work at the site, the Contractor shall conduct a space-by-space inspection with the Contracting Officer or his designated representative and prepare a written inventory of all existing areas where asbestos has been identified as being present (using the installation supplied asbestos sampling report as a basis). This document will be signed and certified as to apparent accuracy by both parties. All areas and materials previously described as containing asbestos shall be treated as such,

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unless the Contractor provides analytical evidence satisfactory to the Contracting Officer that specific portions of the material are not asbestos, or asbestos contaminated.

5.5 Asbestos Removal Plan: At least 3 days prior to the start of asbestos removal work, the Contractor shall submit for approval a complete detailed asbestos removal plan in accordance with Paragraph 5.3(b) above. The plan shall contain the following elements:

5.5.1 Project Containment Strategy: The plan shall be prepared, signed and sealed, including certification number and date by the Contractor's CIH. The plan shall include a sketch and shop drawings showing the location, size, and details of asbestos control of work areas; the location and details, including layout, of the decontamination area as described further in Paragraph 10.0 "DECONTAMINATION ENCLOSURE SYSTEMS"; location of local exhaust equipment and methods and materials to be used to prevent asbestos fiber contamination of the work site and environment. The plan will address all phases of the work including, but not limited to:

- a. Preparation of the work area.
- b. Storage of materials and equipment at the site.
- c. Temporary utilities.
- d. Engineering controls and work practices used to achieve compliance with exposure levels, such as negative air systems, containment barriers, use of removal encapsulants, wet methods, or other methods or combination of methods allowable under 29 CFR 1926.58(g). DRY REMOVAL METHODS WILL NOT BE ALLOWED.
- e. Order of removal.
- f. Decontamination procedures to be used for personnel, work area, and equipment.
- g. Waste disposal.
- h. Air monitoring procedures.
- i. Final decontamination and cleanup.
- j. Procedures for dealing with heat stress.
- k. Emergency procedures.
- l. Notification and permits required.

Prior to starting work, the Contractor, the Contractor's CIH, and the Contracting Officer shall meet to discuss plan details, work procedures, and safety precautions.

5.5.2 Work Schedule: This schedule will include all operations involving asbestos.

5.5.3 Equipment List: Shall include the brand name, model, capacity, performance characteristics (as applicable), quantities, and any other pertinent information for all equipment and materials to be used in all asbestos removal operations performed on this project. Shall include, but not be limited to the following:

- a. Respirators and cartridges.



- b. Vacuums and vacuum equipment.
- c. Protective clothing and other personnel protection equipment.
- d. Trucks used to haul waste.
- e. Containment and disposal of waste materials.
- f. Air sampling pumps.
- g. Wetting agents.
- h. Pressure differential air monitoring devices.

Manufacturers' certificates shall be submitted that all respiratory protection devices and equipment utilized on the site are approved by NIOSH. Provide manufacturer's certificate of HEPA filtration capabilities for all cartridges and filters.

5.6 Asbestos Safety Plan: The Contractor shall submit for approval a detailed safety plan for all phases of the asbestos abatement operation at least three (3) days prior to the start of removal operations. This plan shall include an "Accident Prevention Plan" and shall include, but not be limited to the following elements:

5.6.1 General Safety Procedures:

5.6.2 Respirator Program: This program shall be in accordance with 29 CFR 1926.58(h) and 29 CFR 1910.134(b), (d), (e), and (f) and State and Local regulations.

5.6.3 Medical Surveillance Program: The program shall be in accordance with 29 CFR 1926.58(m), 1926.58(n), and 1910.20.

5.6.4 Emergency Procedures: Emergency procedures shall be in written form and prominently posted in the clean change area and equipment room of the personnel decontamination area. All persons entering the work area shall read and sign the procedures to acknowledge receipt and understanding of the work site layout, location of emergency exits and emergency procedures.

5.7 Asbestos Waste Disposal Plan: This plan will include, but not be limited to the following:

a. Name, location, and telephone number of the landfill used. A copy of the landfill's issued license, and a signed agreement that the landfill will accept the asbestos waste, shall be provided to the Contracting Officer or his representative.

b. Name, address, and telephone number of any waste subcontractors used and the subcontractor's landfill. Provide copies of licenses and signed agreements as in paragraph 5.7(a) above.

c. Should rented equipment be used in removal areas, or to transport asbestos waste materials, a copy of the written notification provided to the rental company informing them of the nature of the use to which the rental equipment will be put shall be included along with the rental company's acknowledgement and agreement.

5.8 Notifications and Permits: It shall be the Contractor's responsibility to secure all permits required and pay any necessary fees to carry out this asbestos removal project.

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5.8.1 Permits: The Contractor shall submit copies of the following:

- a. All permits required by Federal, State, and Local Government Agencies for the type of asbestos removal undertaken.
- b. All permits required by the Federal, State, and Local authorities for asbestos waste hauling and dumping.

5.8.2 Notifications: The Contractor shall make the following notifications:

5.8.2.1 In accordance with 40 CFR 61.146, at least ten (10) days prior to commencement of demolition work, written notices, with copies, of intent to demolish friable asbestos materials shall be sent to:

- a. National Emissions Standard for Air Pollution (NESHAPS) Coordinator at the governing EPA Regional Office.
- b. The State asbestos regulatory office.
- c. Local regulatory office.
- d. Other required notifications.

6.0 PUBLIC WARNINGS AND POSTED SAFETY INFORMATION: In addition to the warning signs required by 29 CFR 1926.58(k), the Contractor shall post the following at the work site:

- a. "DANGER--ASBESTOS HAZARD, AUTHORIZED PERSONNEL ONLY", signs will be posted at all entrances to each building or area in which work will take place. Additional public notices required by State and/or Local governments will also be posted on the structures and at work areas as necessary.
- b. U.S. Department of Labor - OSHA Poster Number 3038 will be hung in a place where it will be clearly visible to personnel each day.
- c. A copy of the U.S. Environmental Protection Agency Regulations for Asbestos, 40 CFR 61, Subpart M, and a copy of U.S. Department of Labor--OSHA Asbestos Regulations, 29 CFR 1926.58.
- d. A list of all scheduled air sampling tests to be completed each day. This list will include the type of sample to be taken, the approximate time it will be taken, and the total amount of air which is to be taken through the filter cassette.
- e. A list of telephone numbers of the local hospital and/or emergency squad, the local police department, the local fire department, a representative of the Contracting Officer who can be reached 24 hours a day, the Contractor's corporate headquarters, and any further professional consultants directly involved in the project.

7.0 PERSONNEL PROTECTION: To protect all personnel, authorized visitors, and others in or around the asbestos removal site during the course of this project, the Contractor shall comply with all of the requirements of 29 CFR 1926.58 and the following requirements:

7.1 Certified Industrial Hygienist (CIH): The Contractor's Certified Industrial Hygienist (CIH) or his representative shall be present on the job site throughout all phases of the removal project to supervise,



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monitor, and document all aspects of the project's health and safety provisions. The Contractor's CIH shall maintain a daily log showing the results of all air sampling tests done throughout each phase of the project; shall stop work inside the work area, or asbestos control area, if measured airborne fiber levels exceed the "action" level of 0.1 FCC outside the work area as defined by 29 CFR 1926.58(b); shall be responsible for maintaining the records required by the medical surveillance program, and collect all samples for the air monitoring program.

7.2 Medical Surveillance: Medical surveillance will be implemented in accordance with the Contractor's submitted Plan, and as a minimum shall comply with the requirements of 29 CFR 1926.58(m) and (n).

7.3 Respirators: The Contractor shall provide appropriate respirators as required for use in accordance with the Contractor's submitted plan and as a minimum shall conform to 29 CFR 1926.58. Fit testing shall be in accordance with 29 CFR 1926.58(h) (4) and Appendix C referenced therein.

7.4 Protective Equipment: The Contractor shall provide an adequate supply of respirators and protective clothing to all employees, authorized visitors, and personnel at the site in accordance with 29 CFR 1926.58(i).

8.0 **MATERIALS AND EQUIPMENT:** Prior to the start of the asbestos removal and disposal work, the Contractor shall have at the site sufficient quantities of all the materials and equipment needed to complete the project in the proper manner, in accordance with 29 CFR 1926.58(g) and Appendices F and G to 29 CFR 1926.58.

9.0 **AIR MONITORING AND ANALYSIS:** Monitoring of airborne concentrations of asbestos fiber shall be done in accordance with 29 CFR 1926.58. The Contracting Officer shall retain the option to perform independent monitoring. One (1) day prior to beginning onsite demolition or construction work, the Contractor shall have the area monitored and establish the background concentrations for each work area. At least three general area air samples in each asbestos removal work area shall be taken.

9.1 Sampling Equipment: The Contractor shall use the following sample collection equipment:

a. High-volume, oil-less, vane-driven pumps with a calibrated air flow of at least 10 liters per minute. The air flow shall be calibrated while the pump is attached to the sampling train.

b. Low-volume, battery powered, body-attachable, portable personnel pumps with a calibrated flow of at least 2 liters per minute and a self-contained power pack capable of sustaining this calibrated flow for at least two hours. This pump unit shall also be equipped with an automatic flow control unit which will maintain a 2-liter per minute flow even as filter resistance increases due to trapped debris.

c. Standard filter cassettes will be utilized in accordance with 29 CFR 1926.58 Appendices A and B.

d. A portable flow calibrator capable of calibration to within +2 percent over a temperature range of -20 degrees C to +60 degrees C and a flow range to 50 liters per minute.

9.2 Type of Air Sampling: Three types of air samples shall be collected by the Contractor.

9.2.1 **Area Samples:** These shall be collected with a high-volume pump and filter cassette. They shall be collected at a single, specific spot, or station. A minimum of 2,000 liters of air shall be passed through the filter for each station sample outside the work area. Minimum collection amounts inside the work area shall be determined by filter loading conditions and consultation between the Contractor and the

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Government, but where possible, shall be sufficient to yield between 100 and 1,300 fibers per square millimeter on the membrane filter.

9.2.2 **Personnel Samples:** These shall be collected with a 2-liter per minute pump and a filter cassette. The cassette shall be attached to the pump with a length of plastic tubing. The cassette will be pinned, clamped, or otherwise securely attached on the forward part of the shoulder of a worker in an acceptable manner. The cassette's exposed filter surface shall be positioned so that it points downward. The pump shall remain attached to the body of the worker and shall run for ten minutes to two hours, adjusted for filter load and working conditions, to produce a filter fiber density of 100 to 1,300 fibers per square millimeter in accordance with 29 CFR 1926.58, Appendix B.

9.2.3 **Dust Samples:** Shall be collected with a 2-liter per minute portable pump equipped with a filter cassette and an extra length of tube extending from the filter end of the cassette. This tube from the forward end of the cassette shall be used in a manner similar to a small vacuum cleaner hose. The hose shall be placed on at least ten spots of visible dust or in areas such as room corners, locker tops, and similar locations where asbestos containing dust is most likely to accumulate. Filters from cassettes used for collecting dust samples shall be analyzed as bulk samples rather than air samples.

9.3 **Sampling Procedures:** The Contractor shall utilize a CIH or a person working under the direct supervision of a CIH to collect all samples. Sampling shall be done in accordance with 29 CFR 1926.58, Appendices A and B.

9.3.1 **Final Air and Dust Samples:** The final air and dust samples will be analyzed using Transmission Electron Microscopy (TEM) methods to determine if asbestos contamination has been reduced to 0.01 FCC or the adjoining environmental concentration, whichever is less.

9.4 **Sample Record Maintenance:** The Contractor shall keep comprehensive records concerning the testing, monitoring, and analysis of air conditions in and around the work area throughout every phase of asbestos removal work.

9.4.1 **Pumps:** The Contractor shall keep records on all air pumps used on this project. "Air pumps" will include high-volume pumps and low-volume personnel pumps. The records shall show:

- a. The manufacturer, model type, and serial number of each item.
- b. The date on which the pump was flow calibrated.
- c. The manufacturer, model type, and serial number of the flow calibrator used to calibrate the pump.
- d. The rate of flow registered by the calibrating instrument for the pump.
- e. The name of the person who performed the calibration.

9.4.2 **Dust Sample Collection:** A hand drawn map marked with X's to show the collection points for dust samples shall accompany each dust sample filter cassette. Each X shall also have a brief written description to further describe the collection point, for instance, "top of pipes".

9.5 **Laboratory Analysis:** The following analytical methods shall be employed where required.

9.5.1 **TEM:** The TEM laboratory shall provide written reports on the samples it processes using TEM analysis.



10.0 **DECONTAMINATION ENCLOSURE SYSTEMS:** Where required by the type of removal procedures utilized, the Contractor shall build suitable framing for the decontamination enclosures. Shop drawings shall be submitted for approval by the Contracting Officer or his representative. Shop drawings shall be submitted as part of the "Asbestos Removal Plan" required by Paragraph 5.5 above, and in accordance with any Contract Clause(s). Adequate descriptions of any portable pre-fab units, if utilized, must be submitted for review and approval by the Contracting Officer or his representative before start of construction. Submittals shall include, but not be limited to, a floor plan layout showing dimensions, materials, sizes, thicknesses, plumbing, and electrical outlets. In all cases access between contaminated and uncontaminated rooms or areas shall be through an airlock. In all cases access between any two rooms within the decontamination enclosure systems shall be through a curtained doorway. The Contractor shall perform maintenance of the enclosure system in accordance with the approved Asbestos Removal Plan.

11.0 **DECONTAMINATION PROCEDURES:**

11.1 Personnel Decontamination Procedures: The Contractor shall ensure that the personnel decontamination procedures are done in accordance with all Federal, State, and Local laws and regulations.

11.2 Equipment Decontamination Procedures: All tools, furnishings, apparatus, fixtures, pieces of equipment, containers of supplies, exterior surfaces of bags or containers containing ACM, and any other item moved out of the sealed work area, or glove-bag, shall be thoroughly decontaminated.

11.2.1 Items removed from the sealed work area shall be HEPA vacuumed, damp wiped, showered thoroughly, wrapped and sealed in multiple layers of polyethylene sheeting. The item shall then be passed into the washroom, where it shall be damp wiped and/or HEPA vacuumed and then placed in the shower and thoroughly scrubbed as necessary. Electrical items which can be damaged by water shall be wrapped and sealed in at least two layers of 6-mil polyethylene sheeting before they are passed into the holding area.

11.2.2 All the Contractor's tools shall be removed from the work site in 6-mil plastic bags or sealed wraps or appropriate containers. Brooms, long scrapers, shovels, and similar implements shall have their working ends bagged. Each bag shall be secured to the handle with tape. Tubs of scrapers, wire brushes, and similar implements shall be completely bagged and sealed prior to their removal from the work area. Coils of hose and electrical wire shall be bagged and sealed prior to removal from the work area. Scaffolding and ladders shall be wrapped in polyethylene. The Contractor shall be responsible for ultimate disposition of contaminated tools and ensure they will be either disposed of or cleaned so as to meet State, Federal, and Local regulations.

12.0 **ASBESTOS REMOVAL PROCEDURE OPTIONS:** The Contractor shall determine the most efficient manner in which to carry out the asbestos removal from the work areas in conformance with this specification. The Contractor shall select from options available and in conformance with 29 CFR 1926.58. The selected options or combinations of options selected to comply with the regulations shall be detailed in the Contractor's Asbestos Removal Plan, including, but not limited to details of construction, materials used, equipment required, work practices to be used, etc. Wet engineering control methods or use of removal encapsulants shall be used to comply with the regulations in conjunction with the selected removal procedures.

12.1 Methods: The following methods shall be used for asbestos removal, as applicable, in accordance with 29 CFR 1926.58.

12.1.1 Removal intact using polyethylene sheeting, glove bags, or liquid encapsulating agents approved by the Contracting Officer.

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12.1.2 A containment barrier with a negative air system shall be used when asbestos insulation or material is stripped, cut, or otherwise removed from piping, duct, walls, or other surfaces and areas of building interiors without use of methods stated in 12.1.1 above.

12.1.3 In areas where establishment of a containment barrier is not practical, the Contractor shall use removal methods, engineering controls, and work practices which will prevent visible emissions and will prevent exceeding asbestos exposure levels in accordance with 29 CFR 1926.58 and 40 CFR 61. Where an enclosure or containment barrier is not provided, the Contractor shall provide a roped off perimeter around the work area where asbestos removal procedures are being performed. Perimeters shall be appropriately marked with warning signs and/or ribbons in accordance with Paragraph 6.0 "PUBLIC WARNINGS AND POSTED SAFETY INFORMATION". All other requirements for asbestos control areas shall be maintained. The perimeter shall be a minimum of twenty (20) feet from the perimeter of the work, or a greater distance as determined by the Contractor's Certified Industrial Hygienist, in order to maintain acceptable asbestos levels in adjacent areas. The Contracting Officer may require that the perimeter distance be expanded to more than twenty (20) feet should air monitoring results show such expansion is warranted. Personnel and area monitoring of airborne fibers shall be conducted during the work shift at the downwind limits of the asbestos work area, at a frequency recommended by the Contractor's CIH, but at intervals no greater than four (4) hours. Should the lesser concentration value of either the action level or twice the background level of airborne asbestos fibers monitored at the designated limited be exceeded, personnel in adjacent areas shall be evacuated. If after checking, adjacent areas are found to be contaminated, then the areas shall be cleaned, inspected for asbestos dust or residue and the fiber concentration of the air in the area checked, as for final cleanup. After cleanup the fiber concentration shall be less than 0.01 FCC of air, or not greater than the reference background, whichever is less. Personnel decontamination facilities shall be provided as appropriate for removal of contaminated clothing, decontamination of personnel equipment, showering, and donning of clean clothing.

12.2 Encapsulation:

12.2.1 Liquid Removal Encapsulants: Shall be stored, handled, and prepared in accordance with the manufacturer's recommendations. Liquid encapsulants shall be penetrating type encapsulant and shall be applied to asbestos-bearing surfaces with airless spray equipment.

12.2.2 Polyethylene Sheeting: Used for wrapping asbestos-contaminated items prior to disposal. Shall be 6-mil in thickness. The asbestos-contaminated items shall be wrapped in two separate layers of polyethylene sheeting, with the seams and other openings of each layer completely and effectively sealed with duct tape.

12.3 Glove Bag Technique: Removal of asbestos using glove bags shall be done using methods and techniques in accordance with 29 CFR 1926.58, Appendix G. Glove bags shall be constructed of 6-mil polyethylene plastic, with two inward projecting longsleeves, rubber gloves, one inward projecting water wand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glove bag shall be constructed and installed in such a manner that it surrounds the object or area to be decontaminated and contains all asbestos fibers during the removal process.

12.4 Containment Barrier and Negative Air System: In situations where intact removal or glove bag techniques are not applicable for removing asbestos from buildings, the Contractor shall erect a containment barrier around the work area and equip the work area with a negative air system. The Contractor shall not remove or strip any asbestos insulation unless this activity is done in a negative air area.

12.4.1 The containment barrier shall consist of temporary partitions made from lumber and covered on both sides with 4-mil polyethylene, and/or 6-mil polyethylene attached to existing walls. All vents, ducts,



grills, and other openings capable of passing air shall be sealed airtight. An opening in the ceiling, walls, or floors which constitute the containment barrier for the work area shall be sealed in this manner.

12.4.2 The negative air system units shall each meet the following minimum requirements:

- a. Deliver its rated volume of air with a clean first stage filter, an intermediate filter, and a primary HEPA filter in place.
- b. The HEPA filter must be certified capable of removing particles of 0.3 microns at a minimum efficiency of 99.97 percent.
- c. Under typical asbestos removal conditions, it must continue to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 2.5 inches of static pressure differential on a manometric gauge.
- d. Must have a manometric gauge to monitor and display readouts of the unit's air pressure difference across the filters.
- e. Must provide a means for the operator to easily interpret the manometric gauge readings in terms of cubic feet of air per minute moving through the machine at any given moment.
- f. Must have an electronic mechanism which automatically shuts the machine off in the event of a filter breach or absence of a filter.
- g. Must have an audible horn which sounds an alarm when the machine has shut itself off.
- h. Must have an automatic safety mechanism which prevents a workman from improperly inserting the main HEPA filter.
- i. Must be ducted through the containment barrier walls to the outside of the work area. When possible, the duct will exhaust into the outside air; otherwise, it will exhaust into the area of the building beyond the containment barrier where no person not appropriately protected shall be admitted. The Unit shall never be exhausted into the work area.

12.4.3 The Contractor shall provide enough negative air system units to change all the air within the containment barrier at least once every 15 minutes. To compute the minimum number of units required, the Contractor shall divide the total cubic footage of the work space by the documented air moving capacity of the filter units. The air moving capacity of any particular kind of HEPA filtration unit shall be measured in cubic feet of air per minute (CFM). The machine's air moving capacity will be that number of CFM it can move when working under a filter load equivalent to 2 inches of static pressure. The Contractor shall compute the total cubic footage of all air space inside the containment barrier. This computation will be recorded and available to the Contracting Officer upon request.

12.5 Asbestos Removal:

12.5.1 All asbestos removal will be in accordance with the Contractor's approved Asbestos Removal Plan. Prior to commencing intact removal procedures, glove bag procedures, construction of a containment barrier and negative air system, or establishment of a perimeter barrier system around a work area, personnel wearing the appropriate protective clothing and respirator as determined by the pre-work air tests, shall enter the work area and begin wetting all asbestos bearing surfaces. All unattached debris shall be collected, contained, and cleaned and disposed of in the required manner for asbestos- contaminated materials.

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12.5.2 Upon completion of the initial debris cleanup, intact removal, glove bag, containment barrier and/or perimeter barrier procedures shall be initiated.

12.5.3 Unless asbestos-bearing surfaces are encapsulated prior to removal, or removed by other means, they shall be wetted with amended water at such intervals as to prevent the asbestos-bearing surface from drying out. At the start of each new work day, the work shall begin with a thorough wetting of the work area. When wetting is conducted inside a containment barrier and negative air system, the wetting shall begin at points most distant from the negative air system unit intake openings and proceed toward the intake openings. The spray equipment used to apply the amended water shall be capable of producing a "mist" application to the the asbestos-bearing surface to reduce the release of fiber. The asbestos-bearing material shall be saturated sufficiently to wet the substrate without causing excess dripping.

12.5.4 In order to maintain asbestos concentrations at a minimum, the saturated, or encapsulated, or otherwise enclosed asbestos must be removed in manageable sections. Asbestos-bearing waste shall not be dropped from a height in excess of 15 feet. For heights up to 50 feet, the Contractor shall provide chutes or scaffolding to intercept the drop.

12.5.5 The Contractor shall place asbestos waste in approved containers, and apply caution labels on the containers in accordance with 29 CFR 1926.58(k) (2) if not already preprinted on the containers. The Contractor shall clean external surfaces of the filled containers thoroughly by wet sponging in the designated area. The containers shall then be moved to the designated area. The containers shall then be moved to the washroom, thoroughly wet-cleaned, and then moved to the holding area pending removal. Uncontaminated personnel shall not enter the washroom or work area; contaminated personnel shall not exit through the equipment decontamination enclosure system.

12.5.6 Containers (bags or drums) shall be sealed when full. Double bagging of wet material, due to its weight, may be necessary and shall be done if single bagging is not adequate. Bags shall not be overfilled. They should be securely sealed to prevent accidental opening and leakage by tying the tops of bags in an overhand knot, or by taping in gooseneck fashion. Do not seal bags with wire or cord. Bags shall be placed in drums for staging and transportation to the approved sanitary landfill. Bags shall be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming before being placed in clean drums and sealed with locking ring tops.

12.5.7 Large components removed intact may be wrapped in two (2) layers of 6-mil polyethylene sheeting secured with tape for transport to the landfill.

12.5.8 Asbestos containing waste with sharp-edged components, such as nails, screws, metal lath, or tin sheeting, will tear the polyethylene bags and sheeting and shall be placed into drums for disposal.

12.5.9 After completion of all asbestos stripping and removal work, surfaces from which asbestos containing materials have been removed shall be wet brushed, wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue.

12.5.10 After the gross amounts of asbestos have been removed from every surface, and/or encapsulated materials have been removed, all remaining visible accumulations of asbestos remaining on floors shall be collected using shovels, dust pans, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the containment barrier as used.

12.5.11 When all coverings have been removed, personnel shall use HEPA vacuum cleaners to vacuum every surface. Particular attention shall be paid to those surfaces or locations which could harbor accumulations of residual asbestos dust.



13.0 **FINAL CLEANUP:** When all visible asbestos has been removed from the work area, the final cleanup phase shall begin. All outer perimeter seals shall remain in place during final cleanup. Protective clothing and respirators shall remain in use. All normal decontamination procedures shall continue to be followed. Containment barriers and negative air systems established inside of buildings shall remain in full operation.

13.1 Personnel shall use buckets of water to which a grease-cutting detergent has been added for washing the exposed surfaces.

13.2 Paper Wiping Cloths shall be wetted in the buckets and then wiped across all spaces of the work area. The wiping cloths shall not be rinsed and reused. Instead, when dirty, they shall be discarded in a debris bag which the personnel shall keep available for this purpose.

13.3 Wiping Down shall continue until final TEM analysis of air samples documents that the area is cleaned. The area shall be considered clean when the asbestos level does not exceed 0.01 FCC.

13.4 No Seals shall be removed until the Contracting Officer has approved such removal.

13.5 Where Perimeter Barrier Methods are used for cleanup of vacant concrete slabs, Final Cleanup procedures shall be carried out in accordance with the Contractor's Asbestos Removal Plan. Asbestos levels after Final Cleanup is complete shall not exceed 0.01 FCC, or the adjacent environmental concentration, whichever is less, to be acceptable.

14.0 **DISPOSAL:** All materials contaminated with asbestos shall be disposed of in accordance with the Contractor's Waste Disposal Plan (Reference Paragraph 5.7 above).

15.0 **PROJECT DOCUMENTATION:** The Contractor shall maintain and shall have available for inspection at the job site, the following:

15.1 A Daily Narrative Log kept by the Contractor's CIH or his designee. This log shall document the major events which occur each day. This log shall provide a comprehensive description of conditions in and around the job site. It shall include the names of all persons who visit the job site and all persons who enter the sealed or restricted work areas. It shall contain the details of all accidents, emergencies, breakdowns of equipment, and any material, procedural or safety difficulties. It shall contain details such as the number of persons on the job, the time they entered the work area and the time they left, and the nature of the work-in-progress. Each day's entries shall be signed and dated by the person who made them.

15.2 A Daily Air Monitoring Log which records all required items outlined in Paragraph 9.0, "AIR MONITORING AND ANALYSIS", subparagraph 9.4, "Sample Record Maintenance".

15.3 Work Schedules and Progress Charts amended on a daily basis.

15.4 Upon Completion of the Work at each structure, slab, or work area, the Contractor shall prepare a report and submit it to the Contracting Officer. The report shall contain:

- a. A summary of all work that was done.
- b. A brief description of how the work was accomplished.
- c. A description of any problem areas encountered during the work.
- d. A copy of the narrative log maintained at the job site throughout the work.

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- e. A copy of the air monitoring log maintained at the job site throughout the work.

16.0 **QUALITY CONTROL:** The Contractor shall establish and maintain a quality control system for all operations performed under this Section to assure compliance with contract requirements and pertinent Federal, State and Local laws, rules and regulations as cited throughout the text of this Section. The Contractor shall maintain records of his quality control for all operations performed, including, but not limited to, the following:

- a. Qualifications of Contractor and Personnel.
- b. Required Notifications and Permits.
- c. Public Warnings and Safety Information.
- d. Containment Barriers, Coverings, and Airlocks.
- e. Personnel Protection.
- f. Decontamination Procedures.
- g. Collecting and Testing of Samples.
- h. Project Documentation.
- i. Asbestos Removal Procedures.
- j. Final Cleanup.
- k. Completion of Work Reports.
- l. Special Conditions.
- m. Disposal Site.
- n. Observance of Safety Regulations.

16.1 Records: Copies of all records of inspection, testing, monitoring, or related items, as well as records of any corrective actions taken, shall be furnished to the Contracting Officer in accordance with Federal, State, and Local regulations, and as otherwise directed.



SECTION 02110 CLEARING AND GRUBBING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for clearing and grubbing.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Clearing: Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Clearing shall also include the removal and disposal of structures that obstruct, encroach upon, or otherwise obstruct the work.

3.2 Grubbing: Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 Tree Removal shall include the felling of trees and the removal of stumps and roots.

3.4 Disposal of Materials: All felled timber, logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be in compliance with all federal, state, and local regulations.

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SECTION 02114 LEAD-BASED PAINT (LBP) REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

The work covered by this section includes furnishing all plant, labor, equipment, materials, and transportation necessary for the proper and safe collection, handling, and packaging of Lead-Based Paint (LBP) waste generated by this project, through the preparation of surfaces for repainting or debris resulting from demolition of fascia, soffit, and gutters.

1.1.1 The LBP-related work for this project includes the removal and proper disposal of paint chips that contains more than 0.5 percent lead in the dry film, and small demolition debris that is coated with lead-based paint that contains more than 0.5 percent lead in the dry film.

1.1.2 The Contractor shall coordinate collection, storage, testing, and disposal of the LBP waste with Directorate of Installation Support (DIS), Environmental Division.

1.1.3 The contractor is required to provide notification to the occupants of quarters involved in This contract in accordance with 40 CFR 745.80. The contractor shall distribute EPA pamphlet "Protect Your Family From Lead in Your Home" and obtain required acknowledgement -certifications statements at the same time notices to occupants are given as specified elsewhere in this contract. The contractor shall provide the government with copies of the acknowledgement - certification forms, indicating on the form the contract number and the street address. This will not relieve the contractor of his legal requirement to keep these forms for his own records for a period of 3 years. It is the contractor's responsibility to obtain adequate copies of the EPA pamphlet.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

Title 29, Code of Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Standards

Part 1026.59 Hazard Communication

Part 1926.62 Lead

Title 49, Code of Federal Regulations, U.S. Department of Transportation (DOT) Standards

Part 171 Hazardous Substances

Part 172 Hazardous Materials Tables and Subparts B
& C Hazardous Materials Communications Regulations

Title 40, Code of Federal Regulations, U.S. Environmental Protection Agency (EPA) Protection of Environment



Parts 240 to 280
Part 745, Subpart L

Resource Conservation and Recovery Act
Lead-Bases Paint Activities

US DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

HUD-1539-LBP
in Housing

Guidelines for the Evaluation and Control of Lead-Based Paint Hazards

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation
of Local Exhaust Systems

ENGINEERING MANUALS (EM)

EM 385-1-1 (1992) U. S. Army Corps of Engineers Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATIONS

NFPA 701 (1996) Methods of Fire Tests for Flame-Resistant Textiles and Film

UNDERWRITERS LABORATORIES INC. (UL) PUBLICATION

UL 586 (1996) High-Efficiency, Particulate, Air Filter Units

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with STATEMENT OF WORK, SW-3:

SD-08 - Statements

1.3.1 Lead-Based Paint Chips/Debris Generation Collection, Handling, and Packaging Plan. This plan shall address:

1.3.1.1 Communication of the lead-based paint hazards associated with this project to Contractor's employees per OSHA 1026.59 Hazard Communication.

1.3.1.2 Worker protection measures. Contractor shall ensure worker protection measures conform to OSHA 1926.62 Lead.

1.3.1.3 Procedures to segregate, contain, and collect paint chips and painted debris generated during performance of the work. Other construction/demolition debris shall not be mixed with paint chips/painted debris.

1.3.1.4 Plans for handling, containerization and proper disposal of paint chips and painted debris.

1.3.2 List of Materials

The Contractor shall submit for approval, a certified list of materials or manufacturer's descriptive literature for all major materials proposed for use in the work specified herein.

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1.3.3 List Of Equipment

The Contractor shall submit a certified list or manufacturer's descriptive literature for all LBP removal, cleaning, personal protective, and air monitoring equipment proposed for use in the work specified herein. The list of equipment shall include certification that the Contractor's vacuums and other filtering equipment meet the requirements of ANSI Z9.2 and UL 586.

1.3.4 Proof of Disposal

The Contractor shall be responsible for the proper handling, packaging, shipment and disposal of all non-hazardous waste generated by this project. The Contractor shall pay for all disposal of non-hazardous waste. The Contractor shall provide a certificate of disposal record for each shipment of non-hazardous waste generated by this project to the DPW Environmental Division, in accordance with 40 CFR Part 268, Resource Conservation and Recovery Act.

1.3.4.1 Non-hazardous waste can be disposed in a demolition landfill permitted for the material, a sanitary landfill, or any other legal facility willing to accept the material. The Contractor shall provide the DIS Environmental Division with a Waste Shipment Record (WSR) signed by a responsible official at the receiving facility within 45 days of initial shipment, in accordance with 40 CFR Part 262, Resource Conservation and Recovery Act.

1.3.4.2 According to EPA guidance, architectural members coated with LBP from residential units may be disposed of in a sanitary or construction/demolition landfill willing to accept the waste. This household exemption does NOT apply to concentrated lead waste, such as chips, dust, sludges or stripping waste. These wastes must be handled as hazardous waste. This exemption applies only to family residences, apartments, barracks, and guest quarters.

1.4 HAZARDOUS WASTE

The Contractor shall be responsible for the proper handling and packaging for disposal of all non-hazardous waste generated by this project. The Government will furnish services for disposal of the Hazardous Waste.

1.4.1 The Government has determined that LBP paint chips and small painted debris are hazardous waste. The Contractor shall properly segregate, collect, label, package and store all generated hazardous waste. The Contractor shall inform the Government Quality Assurance Representative of the types and numbers of containers the Contractor shall use to accomplish this project.

1.4.2

The Designer shall choose among the following three options for handling and packaging of all hazardous waste generated by this project. Selection shall be based on the estimated amount of waste to be generated by the project and the time period over which waste will be generated on the job. The bid form shall include a bid line item for the cost of disposal through the DRMO contractor. In addition, provide the Environmental office with the following information: number of roll-offs needed, size of roll-off needed, building number or Housing subdivision name, generator's name, locations of placed roll-offs, type of waste placed in roll-off, quantities of generated waste estimates, duration of each project (number of months), starting and ending date of each project, and project number. She needs to prepare paperwork to order the dumpsters so you need to give her this info at the same time you send the plans and specs to DOC. On SAF jobs, let her know the status of funding so she knows when funds are received and can send the order in.



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This option should be used when only a small amount of waste is to be generated. The current disposal cost paid to the DRMO contractor is \$.69 per pound. Include a 15% contingency in your estimate of the weight of the waste to insure that enough current year funds are allocated to pay for disposal.

(Option 1) The Contractor shall place all LBP paint chips/small paint debris into properly labeled 55 gallon drums and ship each drum when full to the Government for disposal, up to a maximum of 20 drums for the entire contract. Only one drum is permitted at the job site at a time. The job site shall be treated as a Satellite Accumulation Point. Therefore, the Contractor shall NOT write an accumulation start date on the side of each drum. When each drum is full, the Contractor shall coordinate with the DPW Contract Inspector and ship the drum to the Government's designated less than 90-Day Storage Facility on Post. Waste materials shall be packaged for transportation, in accordance with Department of Transportation (DOT) Regulations found in 49 CFR Parts 171, 172 and 173. The Contractor shall supply Department of Transportation 1A1 or 1A2, 55 gallon steel drums for waste storage. These drums shall be open top in good condition without dents or rust and have the package markings labeled on the side of the drum. The Contractor shall not place any liquid Hazardous Waste in drums containing LBP paint chips/small paint debris. The Contractor shall inspect each drum of Hazardous Waste daily and ensure that the lid on each drum of Hazardous Waste is closed and secured except when the Contractor is placing Hazardous Waste into the drum. The Contractor shall label each drum with the following words "LBP Paint Chips" and "Hazardous Waste" on the side of each drum using a minimum of two-inch high letters. The Contractor shall maintain a log of LBP paint chip/small painted debris waste drums generated during the project. The log shall include name of project, contractor name, container number and description of contents. A copy of the completed log shall be provided to the Government Quality Assurance Representative at the conclusion of the project.

Use this option when there will be a large volume of waste generated but in small amounts over a long period of time. Again, the cost per pound is \$.69 and include a 15% contingency to insure adequate funding.

(Option 2) The Contractor shall place all LBP paint chips/small paint debris into properly labeled 55-gallon drums. Only 1 drum is permitted at the job site at a time. The job site shall be treated as a Satellite Accumulation Point. Therefore, the Contractor shall NOT write an accumulation start date on the side of the drums while they are being filled. Waste materials shall be packaged for transportation, in accordance with Department of Transportation (DOT) Regulations found in 49 CFR Parts 171, 172 and 173. The Contractor shall supply Department of Transportation 1A1 or 1A2, 55 gallon steel drums for waste storage. These drums shall be open top in good condition without dents or rust and have the package markings labeled on the side of the drum. The Contractor shall not place any liquid Hazardous Waste in drums containing LBP paint chips/small paint debris. The Contractor shall inspect each drum of Hazardous Waste daily and ensure that the lid on each drum of Hazardous Waste is closed and secured except when the Contractor is placing Hazardous Waste into the drum. The Contractor shall label each drum with the following words "LBP Paint Chips" and "Hazardous Waste" on the side of each drum using a minimum of two-inch high letters. When each drum is full, they shall be moved to a Contractor provided, approved staging area for the purpose of accumulating up to 50 full drums per approved staging area. The Contractor shall coordinate and receive approval for placement of the staging area(s) from the Government Quality Assurance Representative and Environmental Division. This staging area(s) shall become a Less-than-90-Day Storage Facility. The Contractor shall inspect the staging area(s) weekly and log each inspection. The Contractor's log shall include time, date, and signature of person making inspection, accumulation start date of each drum and condition of Less-than-90-Day Storage Facility at time of inspection. The Contractor shall provide a copy of this log weekly to DPW Contract Inspector. The DPW Environmental Division shall also inspect each staging area(s) or Less-than-90-Day Storage Facility weekly. The Contractor shall prepare all drums in each staging area for one shipment. The Contractor shall coordinate with the Government Quality Assurance Representative and Environmental Division to arrange shipment for disposal of the full drums. The Government will provide services for pickup at the staging area(s) and

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disposal. A DPW Environmental Division representative must be present during the shipment of any Hazardous Waste.

Use this option when a large amount of waste will be generated over a short period of time so as to justify the rental fee. Since there is an additional rental fee beyond the first month. You should insure that the Dumpster will be full within a month, otherwise it may be cheaper to use option 2. Note that we pay a lower rental fee if we can allow 30 days for delivery of the Dumpster. However, only use this if you know you can allow for that long a lead-time in the ordering. The schedule for most jobs may not allow for that. In addition to the rental rates you also pay the \$.69 per pound disposal charge.

Rental rates are:

1st month for a 20 CY Dumpster with 5-day ordering lead-time: \$625

1st month for a 30 CY Dumpster with 5-day ordering lead-time: \$950

1st month for a 20 CY Dumpster with a 30-day ordering lead-time: \$450

1st month for a 30 CY Dumpster with a 30-day ordering lead-time: \$245

Monthly rent after the first month for a 20 CY Dumpster: \$95

Monthly rent after the first month for a 30 CY Dumpster: \$150

(Option 3) The Contractor shall place all LBP lead paint chips/small paint debris into plastic bags and then place the bags into Government furnished 20 or 30 CY Hazardous Waste Roll-ons/Roll-off dumpsters when full. One bag shall be filled at a time. Bags shall be kept closed when waste is not being placed in them. Full bags shall not be accumulated on the job site. If bags are placed in a drum while being filled, the drum shall be kept closed and secured when waste is not being placed in it. If a drum is used, the Contractor shall supply Department of Transportation 1A1 or 1A2, 55 gallon steel drums for that purpose. The drum shall be open top in good condition without dents or rust and have the package markings labeled on the side of the drum. The Contractor shall inspect each drum of Hazardous Waste daily. The Contractor shall label the drum with the following words "LBP Paint Chips" and "Hazardous Waste" on the side of the drum using a minimum of two-inch high letters. The job site shall be treated as a Satellite Accumulation Point. Therefore, the Contractor shall NOT write an accumulation start date on the side of the drum. The Contractor shall place only LBP lead paint chips/small paint debris into the Hazardous Waste Roll-ons/Roll-offs. The Contractor shall not place any liquid Hazardous Waste in large Hazardous Waste Roll-ons/Roll-off. No drums or containers of any size will be placed in Hazardous Waste Roll-ons/Roll-off. The Contractor shall fill the Roll-on/Roll-offs as completely and tightly as possible. The Contractor shall secure the tarp to fully cover each Roll-on/Roll-off after each addition of Hazardous Waste into the Roll-on/Roll-off. The Contract Inspector shall coordinate with the Government Quality Assurance Representative in the ordering, placement and pickup of each Roll-on/Roll-off. The Contractor shall notify the Government 10 calendar days in advance of the need for another Roll-on/Roll-off. Each Hazardous Waste Roll-ons/Roll-offs shall become a Less-than-90-Day-Storage-Facility, in accordance with 40 CFR Part 262, Resource Conservation and Recovery Act. The Contractor shall inspect each Hazardous Waste Roll-ons/Roll-offs area weekly and log each inspection. The Contractor log shall include time, date, and signature of person making inspection, accumulation start date of each Roll-on/Roll-off and condition of Less-than-90-Day Storage Facility at time of inspection. The Contractor shall provide a weekly copy of this log to Government Quality Assurance Representative. The DPW Environmental Division will also be inspecting the Roll-on/Roll-offs on a weekly basis.

1.4.3 The Contractor shall analytically test LBP paint chips/small painted debris generated by this project. The Contractor shall pay analytical testing and disposal costs. The Contractor shall present DPW Contract Inspector with a copy of the analytical test results prior to the project beginning.

1.5 WORKER SAFETY AND PROTECTION



Worker safety and protection is the responsibility of the Contractor. The Contractor shall ensure that his workers are trained and protected IAW applicable OSHA Standard 29 CFR 1926.62 requirements.

1.6 BUILDING PROTECTION

The Contractor shall protect Government employees, occupants, building furnishings, equipment, and other surfaces from the effects of the work.

PART 2 - PRODUCTS

2.1 MATERIALS

Materials furnished under this section shall be standard products of manufacturers regularly engaged in the production of the items, and the most current design, which conforms to the requirements specified.

2.2 LEAD-BASED PAINT (LBP) MATERIALS HANDLING AND EQUIPMENT

Materials and equipment used to wet, remove; seal, handle, and dispose of LBP materials shall conform to the following:

2.2.1 Power Equipment

All power equipment shall conform to OSHA Standards. Equipment guarding shall be present and in good working order IAW EM 385-1-1. The Contractor shall ensure that employees and building occupants are not exposed to equipment noise levels greater than 84 dBA without being provided approved ear protection. All equipment shall be rated intrinsically safe for Class I, Division 1, Groups A, B, C, and D areas.

2.2.3 Vacuum and Exhaust Equipment

All vacuum and exhaust equipment shall have high HEPA filters, which conform to ANSI Z9.2. HEPA filters shall be capable of effectively capturing 99.97 percent of LBP materials. No bypass devices will be permitted. Provisions shall be made to empty the debris collecting hoppers safely without causing visible emissions of particulates.

2.3 WORKER PROTECTIVE CLOTHING AND EQUIPMENT

Selection and use of appropriate protective clothing and equipment is the responsibility of the Contractor. Clothing and equipment shall comply with applicable OSHA Standard 29 CFR 1926.62.

PART 3 - EXECUTION (Not Applicable)

WORK PRACTICES. All work should be undertaken in such a manner as to minimize the generation of dust and to control that which is generated. This is especially important for residential housing, but is also applicable to other buildings. Work in residential housing should be conducted in accordance with the HUD Guidelines. These guidelines provide guidance on dust control, clean up, clearance, work practices, and levels of risk. Work areas shall be cleaned up sufficiently to pass visual and/or dust wipe clearance. These work practices will reduce the risk of lead poisoning of any children or pregnant women in the area.

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SECTION 02210 SITE GRADING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for site grading.

2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of borrow material shall be the Contractor's responsibility.

3.0 EXECUTION:

3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations designated. Topsoil shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

3.2 Excavation: After all stripping has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades designated. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas approved for surplus material storage.

3.3 Preparation of Ground Surface for Fill: All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsatisfactory material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up as directed, in such manner that the fill material will bond with the existing surface.

3.4 Fills and Embankments: The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. Fill shall be satisfactory material and shall be reasonably free from roots, other organic material, trash, and stones having a maximum diameter greater than 6 inches. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment.

3.5 Finished Excavation, Fills, and Embankments: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes.

3.6 Placing Topsoil: On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry.



SECTION 02211 ROCK REMOVAL

1.0 DESCRIPTION OF WORK: This specification covers removal of rock. Operating procedures shall be in accordance with the equipment manufacturer's recommendations. Demolition and removal of material shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Review The Site for existing features, such as buildings or utilities, that will require protection or other coordination of the work.

3.1.2 Clear The Area and excavate as required to provide access to the rock to be removed.

3.1.3 Provide Bracing, Shoring, Etc., as required to safely execute the work.

3.1.4 Provide Dewatering as required.

3.2 Installation:

3.2.1 Remove Rock to the lines required or designated.

3.2.2 Haul Excavated Materials to the area designated.

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SECTION 02215 FINISH GRADING FOR STRUCTURES AND SLABS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for finish grading for structures and slabs.

2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of approved borrow material shall be the Contractor's responsibility.

3.0 EXECUTION:

3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations specified.

3.2 Excavation shall be performed to the required lines and grades. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas approved for surplus material storage.

3.3 Fills and Embankments: The completed fill shall meet the requirements of the particular case. Fill shall be satisfactory material. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment.

3.4 Compaction Requirements: Satisfactory material shall be placed in horizontal layers not exceeding 8 inches in loose depth and compacted to 95 percent maximum density in conformity with ASTM D 1556.



SECTION 02220 SITE EXCAVATION AND FILL

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of material for site excavation and fill.

2.0 **PRODUCTS:** Satisfactory materials shall consist of cohesionless materials classified by ASTM D 2487 as GW, GP, GM, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

3.0 EXECUTION:

3.1 **Excavation:** The Contractor shall perform excavation of every type of material encountered within the limits of the project, to the required lines, grades, and elevations. Satisfactory excavated materials shall be placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials. Additionally required material for fill or embankments shall be excavated from approved borrow areas.

3.2 **Ditches, Gutters, and Channel Changes:** Excavation of ditches, gutters, and channel changes shall be to the required cross sections, grades, and elevations. Backfill shall be thoroughly compacted satisfactory material.

3.3 **Selection of Borrow Material:** Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from approved sources.

3.4 **Backfill:** Backfill adjacent to any and all types of structures shall be placed and compacted in such a manner as to prevent wedging action or eccentric loading upon or against any structure.

3.5 **Embankment:** Earth embankments shall be constructed from satisfactory materials free of organic or frozen material in the embankment and rocks with any dimension greater than 4 inches in the upper 8-inch layer. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth.

3.6 **Compaction Requirements:** Satisfactory material shall be compacted to 90 percent maximum density in conformity with ASTM D 1556.



SECTION 02221 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of materials for excavation, trenching, and backfilling for utilities systems.

2.0 **PRODUCTS:**

2.1 **Satisfactory Materials:** Satisfactory materials shall consist of any cohesionless materials classified by MIL-STD-619 as GM, GW, GP, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.2 **Select Granular Material:** Select granular material shall consist of well-graded sand, gravel, crushed gravel, or crushed slag composed of hard, tough, and durable particles.

3.0 **EXECUTION:**

3.1 **Excavation:** During excavation, material satisfactory for backfilling shall be stockpiled at a sufficient distance from the banks of the trench to prevent slides or cave-ins. Excavated material not required or not satisfactory for backfill shall be removed from the site. Trenches shall be dewatered as required.

3.1.1 **Trench Excavation:** Trench walls below and above the top of the pipe shall be sloped or made vertical, depending on the type of pipe used and the soil conditions. Trench width below the top of the pipe shall not exceed 24 inches plus pipe outside diameter (OD) for pipes of less than 24-inch inside diameter and shall not exceed 36 inches plus pipe OD for larger sizes. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater shall be removed to avoid point bearing.

3.1.2 **Removal of Unyielding Material:** Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with select materials and compacted.

3.1.3 **Removal of Unstable Material:** Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material placed in layers not to exceed a loose thickness at 6 inches and compacted.

3.1.4 **Excavation for Appurtenances:** Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations.

3.2 **Backfilling:** Backfill material shall be placed in layers of 8 inches loose thickness unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils under roadways, railroads, and airfields. Water fluting or jetting will not be permitted.

3.2.1 **Sidewalks, Turfed or Seeded Areas, and Miscellaneous Areas:** Backfill shall be deposited in layers of a maximum of 12 inch loose thickness and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Water flooding or jetting methods



of compaction will be permitted for granular noncohesive backfill material. Water jetting will not be allowed to penetrate the initial backfill.

3.2.2 Trench Backfill: Trenches shall be backfilled to the grade required. The trench shall be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during any required pressure tests.

3.2.3 Displacement of Sewers: After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. If the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed.

3.3 Special Requirements: Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.3.1 Gas Distribution: Trenches shall be excavated to a depth that will provide not less than 18 inches of cover in rock excavation and not less than 24 inches of cover in other excavation.

3.3.2 Water Lines: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, the depth of cover shall comply with NFPA No. 24.

3.3.3 Heat Distribution System: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection. Initial backfill material shall be free of stones larger than 1/4 inch in any dimension.

3.3.4 Electrical Distribution System: Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise required.

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SECTION 02222 STRUCTURAL EXCAVATION

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing of labor and equipment for structural excavation.

2.0 **PRODUCTS:** (Section not used.)

3.0 **EXECUTION:**

3.1 **General:** The excavation shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure. Unsatisfactory material shall be removed, and satisfactory material shall be placed and compacted.

3.2 **Drainage:** Excavation shall be performed so that the area of the site and the area immediately surrounding the site and affecting operations at the site will be continually and effectively drained.

3.3 **Utility and Drain Trenches:** Trenches for underground utilities systems and drain lines within 5 feet of the building or structure shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed.

3.4 **Borrow:** Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained from approved sources.

3.5 **Excavated Materials:** Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed.

3.6 **Final Grade of Surfaces of Support Concrete:** Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation 6 to 12 inches above the bottom of the footing before driving piles. Rock shall be worked down to a satisfactory bed or sidewall.

3.7 **Filling and Subgrade Preparation:** Satisfactory materials free from roots, debris, or stones larger than 3 inches shall be used in bringing fills to the lines and grades indicated and for replacing unsatisfactory materials.

3.8 **Backfilling:** Backfilling shall not begin until construction below finish grade has been approved; underground utilities systems have been inspected, tested, and approved; forms have been removed; and the excavation has been cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.



SECTION 02224 PIPE SLEEVES FOR UTILITY LINES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pipe sleeves for utility lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Jack-Boring Operation: AREA-01.

2.2 Sleeve Materials:

2.2.1 Concrete Pipe: ASTM C 76.

2.2.2 Steel Pipe: ASTM A 53.

2.2.3 Corrugated Steel Pipe: ASTM A 760.

2.2.4 Ductile Iron Pipe: ASTM A 716.

3.0 EXECUTION:

3.1 Roads, Railroads and Airfields: At primary access road crossings, railroad crossings, and at airfield runways and taxiways where aircraft move under their own power, utility lines shall be encased in sleeves of rigid conduit for the length installed under such facilities. Sleeves shall extend a minimum of 5 feet beyond the toe of the slope on each side of the embankment.

3.2 Structures: Where utility lines are required to be installed within 3 feet of existing buildings or structural foundations, the lines shall be encased in sleeves of rigid conduit.

3.3 Clearance: A minimum clearance of at least 2 inches between the inner diameter of the sleeve and the maximum outside diameter of the sleeved pipe, including the joints, shall be provided.

3.4 Sand Bedding: Sand bedding shall be provided for the carrier pipe through the sleeve.

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SECTION 02227 FIELD TESTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for soils compaction testing.

2.0 PRODUCTS:

2.1 Cohesionless and Cohesive Materials: Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH.

2.2 Degree of Compaction: Degree of compaction required as expressed as a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55.

3.0 EXECUTION:

3.1 Compaction Requirements: Each layer shall be compacted to not less than the percentage of maximum density specified below:

Percent CE 55 Maximum Density	

Cohesive Material	Cohesionless Material

Fill, Embankment, and Backfill	
Under proposed structures, building	
slabs, steps, and paved areas.....90	95
Under sidewalks and grassed areas.....85	90
Subgrade	
Under building slabs, steps, and	
paved areas, top 12 inches.....90	95
Under sidewalks, top 6 inches.....85	90

3.2 Test Procedure: Field in-place density shall be determined in accordance with ASTM D 1556 or MIL-STD-621, Method 106 or current Standard.



SECTION 02240 SOIL STABILIZATION - CRUSHED ROCK SUBGRADE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the preparation and production of a stabilized subgrade by adding granular material and/or fines to the native subgrade material.

2.0 PRODUCT: The crushed rock subgrade shall be a composite mixture of coarse aggregate and fine aggregate. Coarse aggregate shall consist of hard, durable particles or fragments of stone, gravel, or slag, or a combination of these. Materials that break up when alternately frozen and thawed, or when alternately wetted and dried are not suitable for stabilized material. Fine aggregate shall consist of natural or crushed sand. The composite mixture of coarse and fine aggregates should be free from vegetable matter and lumps or balls of clay.

Aggregate used shall meet the following gradation limits:

Coarse Aggregate

Retained on 1-1/2 inch sieve	0 percent
Retained on 3/4-inch sieve	0 - 15 percent
Retained on No. 4 sieve, minimum	10 percent
Retained on No. 8 sieve	25 - 70 percent

Fine Aggregate

Retained on No. 40 sieve	50 - 90 percent
Retained on No. 200 sieve	85 - 95 percent

3.0 EXECUTION: Scarify the subgrade to the depth required. Add granular material to the native material that will bring the composite mixture into compliance with subgrade material requirements. Add water and compact subgrade to required density.

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SECTION 02243 SOIL STABILIZATION - HYDRATED LIME

1.0 DESCRIPTION OF WORK: This specification covers furnishing of materials and the preparation and production of a stabilized subgrade by the addition of hydrated lime to the native material.

2.0 PRODUCTS: Hydrated lime material requirements shall be as follows:

2.1 Available Lime Index as Calcium Hydroxide: 90 percent minimum.

2.2 Residue Retained on No. 30 Sieve: 1 percent maximum.

2.3 Residue Retained on No. 200 Sieve: 20 percent maximum.

3.0 EXECUTION:

3.1 Preparation: Scarify the subgrade to the depth required and pulverize the material until it is substantially free of lumps greater than 3 inches in diameter.

3.2 Installation: Lime shall be applied to the pulverized material as a slurry unless otherwise directed. Water shall be added as needed to provide a moisture content of not less than 20 percent. Surface-applied lime slurry shall be plowed and/or disced into the soil as necessary. The resulting mixture shall be aged for not less than 48 hours before compaction.



SECTION 02250 SOIL STABILIZATION - VIBROFLOTATION

1.0 DESCRIPTION OF WORK: This specification covers the densification of sandy subsurfaces by the method of vibroflotation.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION: The vibroflotation process shall be applied only to areas of clean, granular soils, with not over 20 percent silt or 10 percent clay. Vibrators shall be water-jetted into the soil mass to the depth required. The vibrator shall be withdrawn in 1 foot increments as the saturated soil compacts laterally and at a rate of approximately 1 ft/min to a minimum relative density of 70 percent. As the surface crater forms, sand or crushed rock shall be added and compacted to the appropriate line and grade. The horizontal distance between successive treatments shall not exceed 5 feet, or as directed.

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SECTION 02251 SOIL STERILIZATION

1.0 DESCRIPTION OF WORK: This specification covers soil sterilization. Products shall be as directed. Installation procedures shall be in accordance with the product manufacturer's recommendations.

2.0 PRODUCTS:

2.1 Weed Eradication and Soil Fumigation: Products approved by the Environmental Protection Agency.

2.2 Liquid and Dry Herbicides:

2.2.1 Bare Ground Herbicides: Bromacil powder mixture or an ammonium sulfamate spray.

2.2.2 Wetting Agents: As required.

2.3 Equipment: Equipment shall be appropriate to the application and approved before use by the Contracting Officer.

3.0 EXECUTION:

3.1 Soil: After the subgrade has been prepared, all areas to be surfaced shall be treated with a weed eradicator and soil fumigant only in the designated areas.

3.2 Wetting Agents: Wetting Agents may be used as an additive to improve the performance of weed and brush herbicides.



SECTION 02270 SEDIMENT CONTROL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the installation of sediment control by means of a silt fence to control the drifting of silt, sand, dust, or earth.

2.0 PRODUCTS:

2.1 Silt Fence shall be composed of 100 percent spunbonded nylon with polyester netting and shall have the following minimum properties:

Weight	4.2 oz/yd ²	ASTM D 3776
Thickness	10 mils	ASTM D 1777
Grab Tensile	130 lbs.	ASTM D 1682
Elongation to Break	25% ± 3%	ASTM D 1682
Mullen Burst	210 lbs.	
Water Flow Rate	470 gpm/ft ²	
Equip. Opn. Size	70 - 100	
Cord	1/8 in. Nylon Braid	

Strength Retention Ultraviolet Protection

Fabric Width	Supplied in Widths to Meet Local, State, D.O.T., and/or Federal Requirements
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2.2 Fence Posts shall be steel T-posts or cured oak posts, spaced approximately 8 feet apart. Selection of the type of post used, as well as the distance between posts, shall be determined by the manufacturer of the fabric and approved by the Contracting Officer.

3.0 EXECUTION:

3.1 Installation: Installation procedures shall be as recommended by the manufacturer.

3.2 Reuse: Silt fence shall be of such quality that it may be removed and reused at other sites.

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SECTION 02272 GABIONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gabions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wire Cages shall be made of hexagonal twist mesh (3 1/2 inches x 4 1/2 inches) with heavily galvanized steel wire. Wire for wire cages shall be a minimum of 0.118 inch in diameter and shall be in conformance with ASTM A 510 and A 641.

2.2 Lacing Wire shall meet the same specifications as the wire used in the mesh, except that its diameter shall be a minimum of 0.0866 inch.

2.3 Fill Material shall consist of hard, durable, clean stone, 4 to 8 inches in size, or as approved.

3.0 EXECUTION:

3.1 Preparation: Before gabions are placed, the earth on which the gabions are to be placed shall be graded to be relatively smooth.

3.2 Installation:

3.2.1 Baskets shall be delivered in a collapsed form. Erect and lace together with lacing wire.

3.2.2 Install Fill Rock in mesh baskets with appropriate equipment. Manually adjust stone during the filling operation to prevent undue voids.

3.2.3 Hand Place Exposed Faces using selected stone to prevent gabions from bulging. Level the last lift of stone with the top of the gabion to properly close the lid to provide an even surface for the next course.



SECTION 02274 RIPRAP

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of riprap. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Riprap: Stone used for dumped riprap shall be hard, durable, angular in shape, resistant to weathering and to water action, and free from overburden, spoil, shale, and organic material. Neither width nor thickness of a single stone should be less than one third its length. Rounded stone, boulders, shale, and stone with shale seams will not be acceptable. The minimum density of the riprap material shall be 162 pounds per cubic foot. Each load of riprap shall be reasonably well graded. Sand and rock dust exceeding 5 percent by weight of each load shall not be permitted.

2.2 Riprap Bedding: The riprap bedding blanket shall consist of well-graded gravel, crushed rock, sand, or a combination thereof with a maximum size of 6 inches. All material comprising the riprap bedding blanket shall be composed of tough, durable particles, reasonably free from thin, flat, and elongated pieces, and shall contain no organic matter nor soft, friable particles in excess quantities.

3.0 EXECUTION:

3.1 Preparation: Prepare earth slopes by grading and compacting.

3.2 Installation:

3.2.1 Riprap Bedding Blanket Layers shall be placed on the prepared slope or area to develop the full thickness. Each layer shall be placed in one operation, using methods that will not cause segregation of particle sizes within the bedding. The surface of the finished layer should be reasonably even and free from mounds or windrows.

3.2.2 Stone for Riprap shall be placed on the prepared slope or area in a manner that will produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids. Riprap shall be placed to its full course in one operation and in such a manner as to avoid displacing the underlying material. The larger stones shall be well distributed and the entire mass of stone shall be well-graded. The result shall be a compact, uniform riprap layer.

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SECTION 02275 SOIL - CEMENT SURFACING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of soil-cement surfacing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Soil: Use SP and SM soils as classified in ASTM D 2487. The soil aggregate shall contain not more than 55 percent material by dry weight passing the No. 4 sieve and not more than 25 percent material passing the No. 200 sieve. Clay lumps shall be removed.

2.2 Cement: ASTM C 150, Type I.

2.3 Curing Compound: ASTM C 309.

3.0 EXECUTION:

3.1 Place the Plant-Mixed Soil-Cement in uniform lifts and compact to the agreed-upon density as determined by ASTM D 558. The optimum moisture content shall be maintained.

3.2 Finish Soil-Cement Surface to the required lines, grades, and cross sections after compaction.

3.3 Construction Joints: If required, construction joints may be horizontal or vertical.

3.4 Curing: Temporary curing of surfaces to receive subsequent bonded lifts or coatings shall be by water fogging. Final curing shall be by application of a membrane maintained intact for 7 days.



SECTION 02450 RAILROADS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for laying and repairing of railroad track. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations and the American Railway Engineering Association (AREA) publications. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Ballast: Chapter 1, Part 2, AREA-01.

2.2 Oil: ASTM D 402.

2.3 Ties: Wooden, Chapter 3, all parts AREA-01. Concrete, Chapter 10, Part 1, AREA-01.

2.4 Rails: New, Chapter 4, Parts 1 and 2, AREA-01. Relay, Chapter 4, Part 2 "Specifications for Steel Rails" Paragraph 14-Workmanship, AREA-01 Chapter 4.

2.5 Track Fastenings: Track fastening shall include, but not be limited to, bolts and nuts, lockwashers, spikes, rail anchors, tie plates, derails, turnout frogs, and joint bars. Track fastenings shall conform to Chapter 4, Parts 1 and 2 and Chapter 5, Parts 1, 2, and 7, AREA-01.

3.0 EXECUTION:

3.1 Track Removal:

3.1.1 Trackage shall be removed in a manner such as to cause a minimum amount of damage to roadbed.

3.1.2 All Materials Acceptable for Reuse shall, after inspection, be properly stored clear of the work area and separate from new materials.

3.2 Roadbed Preparation:

3.2.1 Damaged Areas in Existing Roadbeds shall be repaired to original condition.

3.2.2 New Roadbeds shall be prepared in accordance with Chapter 1, Part 1 of AREA-01.

3.2.3 Roadbed Surface, Grade, and Drainage shall be approved prior to any distribution of construction material. Ruts and depressions shall be filled and compacted prior to track laying.

3.3 Track Construction:

3.3.1 All Track Construction shall be in accordance with Chapter 5, Parts 4 and 5, of the AREA-01, and in accordance with the adjoining railroad owner/operator specifications and recommendations.

3.3.2 Where Railroads Pass Near Structures where explosives, ammunition, or explosive ingredients are stored, handled, manufactured, or processed, rails that are not electrically continuous and rail switches shall be bonded together by means of flexible copper cable or straps for a distance of at least 100 feet on each side of the structure, and the rails shall be grounded. Where overhead electrical lines in excess of 600 volts

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cross railroad tracks, the rails shall be grounded at points 150 feet on each side of the crossing and the rails bonded between the grounds. At points where the tracks come within 25 feet of structures provided with a grounded system, such grounds shall be interconnected to the nearest rail. The cable used for the interconnection shall be at least 3/4-inch diameter or the same size as the conductors used on the structure.

3.3.3 Crossties shall be spaced in accordance to the adjoining railroad owner/operator specifications, but in no case shall be less than 21 ties per 39 feet of rail or main tracks of 16 ties per 39 feet of rail on sidings and yards.

3.3.4 New Trackage Rail shall be sized in accordance with the adjoining railroad owner/operator requirements. The base of the rail and the surface of tie plates and ties shall be cleaned prior to laying. Only rail saws or track chisels shall be used to cut rail. All new holes shall be drilled or punched.

3.3.5 Existing Trackage Being Rebuilt shall be sized to match the original. Construction of rebuilt trackage shall conform to the same requirements as new construction.

3.3.6 Relayer Rails, in either new or rebuilt tracks, shall be matched to prevent lipped or uneven joints. Any mismatched ends shall be ground or built-up welded.

3.4 Track Maintenance: Track maintenance shall be performed in accordance with Chapter 5, Part 5 of AREA-01.



Section 02511 Portland Cement Concrete Overlays

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Coarse Aggregate:

2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag.

2.1.2 Particle Shape: Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.

2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of 1/4 of the pavement thickness or 2 inches nominal size. Gradation limits are specified in ASTM C 136.

2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits, defined in ASTM C 117 and C 123.

2.2 Fine Aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.

2.3 Portland Cement shall be Type I in compliance with ASTM C 150. **2.4 Air-Entraining Admixture** shall be in compliance with ASTM C 260. Concrete mixtures shall have air content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.

2.5 Concrete Mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.

2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:

2.6.1 Expansion Joint Fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.

2.6.2 Type I Sealant shall comply with Fed. Spec. SS-S-200, except that sealant may be furnished as a ready-mixed liquid.

2.6.3 Type II Sealant shall comply with Fed. Spec. SS-S-1401.

2.6.4 Type V Sealant shall comply with CE CRD-C-527 and may be either a single- or multiple-component material.

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2.7 Epoxy-Resin Materials: Materials used in epoxy-resin grout, mortar, and concrete shall comply with the following:

2.7.1 Epoxy-Resin Grout shall be a two-compound material formulated to comply with ASTM C 881.

2.7.2 Epoxy-Resin Concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 or 1/2 inch.

2.8 Dowels shall be plain steel bars complying with ASTM A 499.

3.0 EXECUTION:

3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc. to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of epoxy-resin grout and Portland cement mortar.

3.2 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.

3.3 Vibration: In the final phases of placing, surface vibrating equipment shall be used, and the duration of vibration shall not exceed 20 seconds.

3.4 Joints shall be saw cut and in alignment with underlying existing joints.

3.5 Finishing:

3.5.1 Transverse Finishing: Immediately after placement, concrete shall be accurately struck off and screeded to such elevation that when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.

3.5.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.

3.5.3 Hand Finishing shall be with an approved strike and tamping template and a longitudinal float.

3.5.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.

3.5.5 Burlap Drag Finishing: When most of the water glaze or sheen has disappeared and before the concrete becomes nonplastic, drag the surface of the pavement in the direction of the concrete placement with a multiple-ply burlap drag.

3.5.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.

3.6 Concrete Curing and Protection:

3.6.1 Concrete Curing Methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.



3.6.2 Concrete Protection: Protect repaired areas against damage prior to final acceptance. Traffic shall be excluded from repaired areas.



Section 02512 Steel Reinforced Portland Cement Concrete Overlays

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel reinforced Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Coarse Aggregate:

2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag. **2.1.2 Particle Shape:** Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.

2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of one-fourth of the pavement thickness or a nominal size of 2 inches. Gradation limits are specified in ASTM C 136.

2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits defined in ASTM C 117 and C 123.

2.2 Fine Aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.

2.3 Portland Cement shall be Type I in compliance with ASTM C 150.

2.4 Air-Entraining Admixtures shall be in compliance with ASTM C 260. Concrete mixtures shall have air content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.

2.5 Concrete Mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.

2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:

2.6.1 Expansion Joint Fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.

2.6.2 Type I Sealant shall comply with Fed. Spec. SS-S-200, except that sealant may be furnished as a ready-mixed liquid.

2.6.3 Type II Sealant shall comply with Fed. Spec. SS-S-1401.

2.6.4 Type V Sealant shall comply with CE CRD-C-527 and may be either a single- or multiple-component material.

2.7 Epoxy-Resin Materials: Materials used in epoxy-resin grout, mortar, and concrete shall comply with the following:



2.7.1 Epoxy-Resin Grout shall be a two-compound material formulated to comply with Fed. Spec. MMM-A-001993.

2.7.2 Epoxy-Resin Concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 inch or 1/2 inch.

2.8 Steel Reinforcement: All reinforcement shall be free from loose flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce bond. Bar mats shall comply with ASTM A 184. Welded steel wire fabric shall comply with ASTM A 185. Tie bars shall be deformed bars in compliance with ASTM A 615, A 616, or A 617. Dowels shall be plain steel bars complying with ASTM A 499.

3.0 EXECUTION:

3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of epoxy-resin grout and Portland cement mortar.

3.2 Reinforcement Steel shall be installed by the strike-off method wherein the concrete is deposited on the subgrade and struck to the indicated elevation of the steel. The reinforcement shall be laid upon the prestruck surface.

3.3 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.

3.4 Vibration: In the final phases of placing, surface vibrating equipment shall be used, and the duration of vibration shall not exceed 20 seconds.

3.5 Joints shall be saw cut and in alignment with underlying existing joints.

3.6 Finishing:

3.6.1 Transverse Finishing: Immediately after placement, the concrete shall be accurately struck off and screeded to such elevation that when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.

3.6.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.

3.6.3 Hand Finishing shall be done with an approved strike and tamping template and a longitudinal float.

3.6.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of longhandled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.

3.6.5 Burlap Drag Finishing: When most of the water glaze or sheen has disappeared and before the concrete becomes nonplastic, the surface of the pavement shall be dragged in the direction of the concrete placement with a multiple-ply burlap drag.

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3.6.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints, where indicated or directed, shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.

3.7 Concrete Curing and Protection:

3.7.1 Concrete Curing Methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.

3.7.2 Concrete Protection: Repaired areas shall be protected against damage prior to final acceptance. Traffic shall be excluded from repaired areas.



Section 02513 Fibrous Reinforced Portland Cement Concrete Overlays

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fibrous reinforced Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Coarse Aggregate:

2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag.

2.1.2 Particle Shape: Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.

2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of one-fourth of the pavement thickness or 2-inch nominal size. Gradation limits are specified in ASTM C 136.

2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits defined in ASTM C 117 and C 123.

2.2 Fine Aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.

2.3 Portland Cement shall be Type I in compliance with ASTM C 150.

2.4 Air-Entraining Admixture shall be in compliance with ASTM C 260. Concrete mixtures shall have air content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.

2.5 Concrete Mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.

2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:

2.6.1 Expansion Joint Fillers shall comply with ASTM D 1751 or D 1752 and shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.

2.6.2 Type I Sealant shall comply with Fed. Spec. SS-S-200, except that sealant may be furnished as a ready-mixed liquid.

2.6.3 Type II Sealant shall comply with Fed. Spec. SS-S-1401.

2.6.4 Type V Sealant shall comply with CE CRD-C-527 and may be either a single- or multiple-component material.

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2.7 Epoxy-Resin Materials: Materials used in epoxy-resin grout, mortar, and concrete shall comply with the following:

2.7.1 Epoxy-Resin Grout shall be a two-compound material formulated to comply with ASTM C 881.

2.7.2 Epoxy-Resin Concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 inch or 1/2 inch.

2.8 Steel Fibers: The fibers shall be made from low carbon steel. The following sizes of steel are acceptable: 0.010-inch x 0.022-inch flat steel fiber, 0.010-inch x 0.50-inch round steel fiber, 0.016-inch x 1.0-inch round steel fiber, and 0.016-inch x 0.75-inch round steel fiber with 0.010-inch x 0.020-inch flat section along the length of the fiber and 2.5-inch x 0.025-inch round steel fibers.

3.0 EXECUTION:

3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of epoxy-resin grout and Portland cement mortar.

3.2 Batching: Fibers and aggregate shall be blended prior to charging the mixer. The introduction of cement, water, and additives shall be matched with the rate of flow of the fiber-aggregate mixture to assure uniform mix.

3.3 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.

3.4 Vibration: In the final phases of placing, surface vibrating equipment shall be used and the duration of vibration shall not exceed 20 seconds.

3.5 Joints shall be saw cut and in alignment with underlying existing joints.

3.6 Finishing:

3.6.1 Transverse Finishing: Immediately after placement, the concrete shall be accurately struck off and screeded to such an elevation that, when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.

3.6.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.

3.6.3 Hand Finishing shall be done with an approved strike and tamping template and a longitudinal float.

3.6.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.

3.6.5 Broom Finishing: Burlap drag finishing will not be allowed as this brings the steel fibers to the surface. Finishing shall be accomplished using a stiff broom.



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3.6.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints, where indicated or directed, shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.

3.7 Concrete Curing and Protection:

3.7.1 Concrete Curing Methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.

3.7.2 Concrete Protection: Repaired areas shall be protected against damage prior to final acceptance. Traffic shall be excluded from repaired areas.

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SECTION 02514 ASPHALTIC CONCRETE OVERLAYS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphaltic concrete overlays. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Cement: The asphalt cement shall comply with ASTM D 946 penetration grade 85-100 requirements and shall show a negative spot test when tested in compliance with AASHTO T 102.

2.2 Mineral Aggregates: Shall comply with ASTM D 3515 for 3/4-inch maximum aggregate mix.

2.3 Test Properties: The bituminous mixture shall meet the following requirements when tested in compliance with MIL-STD 620.

Stability minimum, lb.....500
Flow maximum, 1/100-in. units.....20
Voids total mix, %.....3-5
Voids filled with bitumen, %.....75-85

3.0 EXECUTION:

3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. An asphalt tack coat shall be applied to all contact surfaces in advance of the asphalt concrete overlay placement. The asphalt tack shall be placed at an asphalt residue coverage rate of 0.05 gal/sq yd.

3.2 Installation:

3.2.1 Joints: Longitudinal joints of the overlay shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.

3.2.2 All Asphalt Concrete Mixture and Pavement that are contaminated, damaged, or defective shall be removed and replaced by the Contractor. Skin patching of rolled pavement will not be permitted.

3.2.3 Compaction of Mixture: The asphalt concrete mixture shall be rolled until a density of not less than 95 percent and not more than 100 percent of laboratory compacted specimen is obtained.

3.2.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a 10-foot straightedge laid on the surface.



SECTION 02515 CRUSHED STONE PAVING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of crushed stone paving. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aggregates: Aggregates shall consist of natural gravel, crushed stone or slag, crushed gravel, angular sand, or other approved materials. Aggregates shall be durable, sound, and free from foreign material, including objectionable coatings, lumps and balls of clay, and organic matter.

2.1.1 Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles (length to width greater than 3 to 1) shall not exceed 30 percent.

2.1.2 Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum site gradation sieve specified.

2.1.3 Crushed stone shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces for each range of sizes.

2.1.4 Slag shall be an air-cooled blast-furnace product having a dry weight of not less than 65 pcf.

2.2 Binder Material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.3 Gradation Requirements specified in the following table shall apply to the completed aggregate surface. The table shows permissible gradings for granular material used in aggregate surface roads and airfields. Sieves shall conform to ASTM E 11.

Gradation for Aggregate Surface Courses

Sieve Designation	No. 1	No. 2	No. 3	No. 4
25.0 mm 1 in.	100	100	100	100
9.5 mm 3/8 in.	50-85	60-100	--	--
4.7 mm No. 4	35-65	50-85	55-100	70-100
2.0 mm No. 10	25-50	40-70	40-100	55-100
0.425 mm No. 40	15-30	24-45	20-50	30-70
0.075 mm No. 200	8-15	8-15	8-15	8-15

2.4 Liquid Limit and Plasticity Index: The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

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3.0 EXECUTION:

3.1 Preparation: The previously constructed layer or base shall be cleaned of loose and foreign matter. Adequate drainage shall be provided. Ruts or soft spots shall be corrected. For cohesionless underlying materials, the surface shall be stabilized with aggregate prior to placement of the stabilized-aggregate course.

3.2 Installation:

3.2.1 Mixing and Placing: Materials shall be mixed in such a manner as to obtain a uniform stabilized-aggregate material and a uniform optimum water content for compaction. Mixing and placing procedures shall produce true grades, minimize segregation and degradation, optimize water content, and ensure a satisfactory base course.

3.2.2 Compaction: Each layer of stabilized-aggregate paving shall be compacted. Water content shall be maintained at optimum. Areas inaccessible to the rollers shall be compacted with mechanical tampers and shall be shaped and finished by hand methods.

3.2.3 Layer Thickness: No layer shall be in excess of 8 inches nor less than 3 inches in compacted thickness.

3.2.4 Proof Rolling: Materials in paving or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompact.

3.2.5 Edges of Paving: Approved materials shall be placed along edges of stabilized-aggregate paving course in such quantities as will compact to thickness of the course being constructed, allowing at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of the paving course.

3.2.6 Finishing: Finished surface shall be of uniform grade and texture.

3.2.7 Thickness Control: Compacted thickness of the stabilized paving course shall be within 1/2 inch of the thickness required.



SECTION 02520 PORTLAND CEMENT CONCRETE SIDEWALKS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of Portland cement concrete (PCC) sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94, Alternate No. 2. The concrete shall have a slump of not more than three inches. The concrete shall attain a minimum compressive strength of 2,500 psi at seven days.

2.2 Aggregates: ASTM C 33.

2.3 Reinforcement Steel: Wire mesh reinforcement shall comply with ASTM A 184.

2.4 Expansion Joint Fillers: Expansion joint fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard complying with ASTM D 1752.

2.5 Joint Sealers: CE CRD-C-527.

3.0 EXECUTION:

3.1 Reinforcement Steel: Fasten reinforcement steel accurately and securely in place with suitable supports and ties before the concrete is placed.

3.2 Concrete Conveying: Convey concrete to construction areas by methods that will prevent segregation.

3.3 Concrete Placing: Moisten the subgrade just before the concrete is placed. Place concrete in one layer of such thickness that when compacted and finished the sidewalk will be of the required thickness.

3.4 Edge and Joint Finishing: Carefully finish all slab edges, including those at formed joints, with an edger having a radius of 1/8 inch.

3.5 Contraction Joints: Divide the concrete surface into rectangular areas by means of contraction joints spaced at not more than five feet on center.

3.6 Expansion Joints: Form expansion joints about structures and features that project through or into the sidewalk pavement. Fill expansion joints with joint filler of the type, thickness, and width to match existing or as directed by the Contracting Officer. Place the joint filler with the top edge 1/4 inch below the surface. Remove concrete over the joint filler.

3.7 Joint Sealing: At the end of the curing period, carefully clean and seal expansion joints.

3.8 Portland Cement Concrete Curing: Cure new concrete by protection against loss of moisture and rapid temperature changes for a period of not less than 7 days.

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3.9 Backfilling: After curing, remove debris adjoining the sidewalk, backfill, grade, and compact to conform to the surrounding area.



SECTION 02521 ASPHALT CONCRETE SIDEWALKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt concrete sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphaltic Concrete:

2.1.1 Hot-Mixed, Hot-Laid Bituminous Paving Mixtures: ASTM D 3515.

2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes: Asphalt Institute Manual MS-14.

2.2 Bituminous Prime: ASTM D 2027, Grades MC-30 or MC-70; ASTM D 2028, Grade RC-70; or ASTM D 2026, Grade SC-70.

2.3 Base Course: ASTM D 2940.

2.4 Bituminous Tack Coat: ASTM D 977, Grades RS-1, MS-1 or SS-1h; ASTM D 2027, Grade MC-30; ASTM D 2028, Grade RC-70; ASTM D 2026, Grade SC-70; or ASTM D 2397, Grades CRS-1 or CSS-1.

2.5 Seal Coat: ASTM D 2027, Grade MC-250 or MC-800; or D 2028, Grade RC-250 or RC-800.

2.6 Slurry Coat Mixture shall be comprised of 70 percent sand or fine aggregate, 10 percent water, and 20 percent liquid or emulsified asphalt.

2.6.1 Fine Aggregate: ASTM D 1073, Grade 2.

2.6.2 Emulsified Asphalt: ASTM D 977, Grades SS-1 or SS-1h.

3.0 EXECUTION:

3.1 Application Temperatures: Application temperatures for all asphalt materials shall comply with provisions of the Asphalt Institute publications and the applicable ASTMs.

3.2 Subgrade: Construct the subgrade or walkway replacement true to grade and compact as required.

3.3 Base Course:

3.3.1 Placing: Spread the base course material evenly upon the prepared subgrade, in a layer of such depth that when compacted the layer will be uniform and of the thickness required.

3.3.2 Compaction: Immediately following the spreading of the material, compact the base course with equipment to a density as required.

3.4 Surface Course:

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3.4.1 Placing: Apply prime coat, and allow it to cure. The placing of the mixture shall be continuous. Paint all contact surfaces of previously constructed sidewalk with a tack coat of rapid-setting liquid asphalt just before the fresh mixture is placed.

3.4.2 Forms: Set forms with the upper edge true to line and hold grade rigidly in place by stakes placed on the outside of the forms and set flush with the top edge of the forms.

3.4.3 Compaction: Immediately following the placement of the asphalt concrete mixture, compact the surface course with equipment to a density as required.

3.4.4 Backfilling: After removing the forms and debris, backfill the exposed or excavated area adjoining the sidewalk with granular material, grade, and compact to conform to the surrounding area.

3.5 Patching:

3.5.1 For Repair Operations Involving Raveling, Heaving, Spalling, and Alligating: Cut asphalt concrete paving back to solid material, making cut area rectangular with vertical sides. Remove deteriorated pavement including base material if required. Replace base course, compact, and tack coat the base material and the vertical surfaces of cut area. Fill area with new asphalt concrete and compact level with existing walkway. Dust patched area with sand or mineral dust.

3.5.2 Pothole Repair: Cut rectangular hole around pothole back to solid pavement leaving straight, vertical edges. Remove loose material and water to firm base. Fill holes and compact to within 3 inches of the surface in layers not exceeding 6 inches with either base material or asphalt mixture. Apply tack coat to base material and vertical edges. On the surface layer, fill with asphalt mixture and mound to such height that when compacted the mix will be level with surrounding walkway surface. Dust patched area with sand or mineral dust.

3.5.3 Low Spot or Depression Repair: Determine limits of depression with straightedge, and mark outline with crayon. Apply tack coat, 0.05 to 0.15 gallon per square yard, to the cleaned area, and allow to cure. Spread area with asphalt concrete mix and feather edge by raking and manipulation of the material. Roll and compact area to surrounding walkway level. Recheck with straightedge. Apply a sand seal to the patched area to prevent entrance of water.

3.5.4 Polished Aggregate Repair: Clean and dry area thoroughly. Apply tack coat at a rate of 0.05 to 0.15 gallon per square yard; overlay area with new asphalt concrete mix to a minimum 1-1/2 inch thickness and feather to adjoining walkway surfaces. Roll with pneumatic or steel rollers.

3.5.5 Damaged Edging Repair: Remove damaged or deteriorated edging materials and replace.

3.5.6 Prime Coat: Prime new base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per square yard. Take care to apply no more asphalt than will penetrate into the base course during curing. Blot excess prime with sand before the surfacing material is applied.

3.5.7 Tack Coat: Surfaces and cut edges of existing asphalt concrete shall be given a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per square yard. After application of the tack coat, allow time for the material to cure before surfacing and patching material is placed.

3.5.8 Seal Coat Spray Application: Walkway surfaces that are to be sealed shall receive a liquid asphalt coat applied at a rate of 0.15 to 0.20 gallon per square yard, along with a fine aggregate at a rate of 15 to 20 pounds per square yard.



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3.6 Crack Repair: Fill cracks with liquid asphalt, sand asphalt emulsion water mixture, or slurry seal. After thorough cleaning, work the mixture into cracks by broom or squeegee. Cracks 1/8 to 1/2 inch width shall be slurry sealed and filled with liquid asphalt. Dust repaired cracks with fine aggregate or mineral dust to prevent cracking. Final thickness of the slurry seal shall be 1/8 inch minimum.

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Section 02522 Miscellaneous Sidewalks

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gravel, masonry, and wood sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aggregate shall comply with the following:

2.1.1 Surface Course Aggregates shall be well-graded, crushed stone, 3/4- to 1-1/4 inch size, consisting of clean, sound, durable particles.

2.1.2 Masonry Grout Aggregate: ASTM C 404, Size 2.

2.2 Base Course: Base course material shall be a granular, dense-graded, high-quality compactible material.

2.3 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94. The concrete shall attain a minimum compressive strength of 2,500 psi at 28 days.

2.4 Portland Cement Concrete: Cement shall comply with ASTM C 150.

2.5 Joint Filler: Masonry joint filler shall be Portland cement concrete mix with cement complying with ASTM C 150.

2.6 Masonry Units: Color and texture shall match the existing as nearly as is practicable.

2.7 Wood and Preservatives: Footboards and supports shall be 1-1/2 inch thick Number 1 dense Douglas fir or yellow pine lumber, pressure-treated with chromated copper arsenate (CCA) preservative complying with AWWA P5. Retention shall be a minimum of 0.25 pounds per cubic foot.

3.0 EXECUTION:

3.1 Base Course Repair: Remove material in soft spots to such depth required to provide a firm foundation for surface materials and fill with granular material of a quality that will compact when moistened. Roll or tamp this material to obtain the proper density.

3.2 Surface Repair:

3.2.1 Aggregate Walkways: Spread the surface material evenly on the base course in a layer of such depth that when compacted, the layer will be uniform with a minimum thickness of 4 inches.

3.2.2 Joint Filling: Completely remove and clean the joint of all loose joint material, dirt, clay, or other foreign matter. Fill the joint flush with concrete to provide a uniform surface.

3.2.3 Wood Walkways: Secure wood members with galvanized nails, screws, bolts, or other approved fasteners to ensure tight joints.



3.2.4 Masonry Walkways: New or salvaged masonry units will be placed on a 3/4-inch mortar setting bed with mortar joints matching the existing walkway. Place the setting bed on a fresh 3-inch thick Portland cement concrete slab.

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SECTION 02523 PRECAST SIDEWALKS AND PAVERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast sidewalks and pavers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Precast Concrete Patio Blocks: Natural or colored, 2 inches thick.

2.2 Exposed Aggregate or Granite: ASTM C 615 and National Building Granite Quarries Association, Inc.

2.2.1 Exposed Limestone: Limestone (Oolitic), ASTM C 568, Category II.

2.2.2 Exposed White Tumblestone Aggregate: As directed.

2.3 Stone Pavers:

2.3.1 Bluestone Flagging Paver: Irregular cut, 1 inch thick.

2.3.2 White Marble, Crushed Stone: ASTM C 503 and Marble Institute of America (MIA), 3 inches thick.

2.3.3 Bluestone, Crushed Stone: 3 inches thick.

2.3.4 Natural Cleft Slate: ASTM C 629, 3/4-inch irregular cut, 1/2-inch random rectangular cut, or 1/4-inch random rectangular butted joints.

2.4 Granite Blocks: Blocks shall be 3 to 5 inches thick and comply with requirements of ASTM C 615 and National Building Granite Quarries Association, Inc. Sizes shall be 3- 1/2 inches square; 4 to 12 inches by 3 to 5 inches; and 6 to 15 inches by 3 to 6 inches.

2.5 Mortar and Grout:

2.5.1 Portland Cement: ASTM C 150 and the staining requirements of ASTM C 91.

2.5.2 Masonry Cement: ASTM C 91, non-staining.

2.5.3 Hydrated Lime: ASTM C 207, Type S.

2.5.4 Sand: ASTM C 144.

2.5.4.1 White Pointing Mortar: Natural white sand or ground white stone.

2.5.4.2 Colored Pointing Mortar: Marble, granite, or sound stone.

3.0 EXECUTION:



3.1 Preparation:

3.1.1 Clean Stone or Concrete Block with clear water.

3.1.2 Ferrous Metal: Apply a heavy coat of bituminous paint on metal surfaces in contact with block.

3.2 Installation:

3.2.1 Expansion Joints: Install continuous strips of preformed joint filler.

3.2.2 Clean Subbase and saturate with clean water.

3.2.3 Slush Coat: Apply 1/16-inch thick slush coat of cement grout over concrete subbase about 15 minutes prior to placing setting bed.

3.2.4 Setting Bed: Mix one 94-pound bag of cement to 3 cu ft of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of stone. Spread and screed to a uniform thickness.

3.2.5 Set Stone or Concrete Block before initial set of cement bed occurs. Wet stone or block thoroughly before setting. Apply a thin layer of neat cement paste 1/32-inch to 1/16-inch thick to setting bed, or bottom of stone or block.

3.2.6 Grout Joints as soon as possible after initial set of setting bed and tool slightly concave. Use grout mix of one bag Portland cement to 2 cu ft sand. Cure grout by maintaining in a moist condition for 7 days. Do not permit traffic on surface during setting of units or for at least 24 hours after final grouting of joints.



Section 02525 Concrete Curbs And Gutters

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete curbs and gutters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Curing Materials:

2.1.1 Burlap: AASHTO M 182 having a weight of 14 ounces or more per square yard when dry.

2.1.2 Impervious Sheeting: ASTM C 171.

2.1.3 Liquid Membrane Curing Compound: ASTM C 309. Compound shall be free of paraffin or petroleum.

2.2 Joint Materials:

2.2.1 Expansion Joint Fillers: ASTM D 1751 or ASTM D 1752.

2.2.2 Joint Sealers: CE CRD-C-527.

2.3 Concrete: Concrete shall have a minimum compressive strength of 3,000 psi. The maximum size of aggregate shall be 1-1/2 inches. Concrete shall have a slump of not more than 3 inches and an air content by volume of concrete of 3 to 6 percent.

2.4 Forms: Curb and gutter forms shall be of wood or steel. The outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter and shall be securely fastened to and supported by the outside form. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch plywood. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.

3.0 EXECUTION:

3.1 Preparation: The subgrade shall be constructed to grade and cross section. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement and shall be compacted. The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed.

3.2 Installation:

3.2.1 Form Setting: Forms for curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms.



3.2.2 Concrete Placement and Finishing: Concrete shall be placed in layers not to exceed 6 inches. Concrete shall be thoroughly consolidated. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch, and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed. The surface shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float. Expansion joints and contraction joints shall be constructed at right angles to the line of curb and gutter. Contraction joints shall be constructed by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and gutter. Contraction joints shall match joints in abutting Portland cement concrete pavement. At other pavements, construction joints shall be placed at not less than 5 feet nor greater than 15 feet apart. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb at the end of all returns. Expansion joints shall match expansion joints of abutting Portland cement concrete pavement. At other pavements, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 45 feet. Exposed concrete surfaces shall be cured for not less than 7 days.

3.2.3 Backfilling: After curing, debris shall be removed, and the area adjoining the concrete shall be backfilled, graded, and compacted.

3.2.4 Sealing Joints: Expansion joints and the top 1-inch depth of contraction joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

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Section 02570 Portland Cement Concrete

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of Portland cement concrete (PCC) pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Ready-Mixed Concrete shall comply with ASTM C 94, Alternative No. 2. The concrete shall have a slump of not more than three inches. The concrete shall attain a minimum compressive strength of 2,500 psi at seven days.

2.2 Aggregates shall comply with ASTM C 33.

2.3 Air Entraining Admixtures shall comply with ASTM C 260.

2.4 Concrete Curing Materials shall comply with one of the following:

2.4.1 Burlap: AASHTO M182.

2.4.2 White, Opaque Polyethylene-Coated Burlap: ASTM C 171.

2.4.3 White, Opaque Polyethylene Sheeting: ASTM C 171.

2.4.4 White Waterproof Paper: ASTM C 171.

2.4.5 Liquid Membrane Curing Compound: ASTM C 309.

3.0 EXECUTION: (Not used.)



SECTION 02575 BRIDGE DECK ASPHALT CONCRETE WEARING SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of bridge deck asphalt concrete wearing surfaces. Products shall match those existing and/or as shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. The standard specification for highway construction for the state in which the project is located shall be considered the standard for material, equipment, details, and construction methods as supplemented hereafter.

2.0 PRODUCTS:

2.1 Aggregate:

2.1.1 Coarse Aggregate for Bituminous Mixtures: ASTM D 692.

2.1.2 Fine Aggregate for Bituminous Mixtures: ASTM D 1073.

2.1.3 Mineral Filler for Bituminous Mixtures: ASTM D 242.

2.2 Bituminous Materials:

2.2.1 Asphalt Cement: ASTM D 946, penetration grade 85-100.

2.2.2 Anionic Emulsified Asphalt: ASTM D 977, SS-1 or SS-1h.

2.2.3 Rapid Curing Type Liquid Asphalt: ASTM D 2028, RC-70 and RC-250.

2.2.4 Medium Curing Type Liquid Asphalt: ASTM D 2027, MC-30, MC-70, and MC 800.

2.2.5 Coal-Tar Pitch: Specific gravity shall be 1.20 to 1.27 at 77 degrees.

2.2.6 Coal-Tar Pitch Emulsion: ASTM D 3320.

2.2.7 Fiberglass Fabric: ASTM D 1668, Type II or III.

2.3 Asphalt Mixture:

2.3.1 Asphalt Seal Coat: RC-70 or MC-70 with following aggregate:

Sieve Size	Percent Passing (Wt.)

1/2-in.	100
3/8-in.	94-100
No. 4	15-45
No. 16	0-4

2.3.2 Asphalt Slurry Seal: SS-1 or SS-1h with following aggregate:

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Sieve Size	Percent Passing (Wt.)

No. 8	100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Mix shall contain not less than 15 percent asphalt emulsion nor more than 10 percent water by weight.

2.3.3 Asphalt Patch Mix: RC 250 or MC 800 with the following aggregate.

Sieve Size	Percent Passing (Wt.)

3/4-in.	100
1/2-in.	85-100
No. 4	65-80
No. 8	50-65
No. 16	37-52
No. 30	25-40
No. 50	18-30
No. 100	10-20
No. 200	3-10

Liquid asphalt shall not be less than 5 percent by weight.

2.3.4 Coal-Tar Emulsion Slurry: The slurry shall not have more than 10 percent water or 5 pounds of aggregate per gallon of coal-tar emulsion. Aggregate shall have the following gradation:

Sieve Size	Percent Passing (Wt.)

No. 10	100
No. 16	30-65
No. 30	0-5

2.3.5 Asphalt-Sand Seal Protection Mix: Asphalt cement penetration shall be grade 85-100 with the following aggregate.

Sieve Size	Percent Passing (Wt.)

3/8-in.	100
No. 4	97-100
No. 10	80-95
No. 40	50-70
No. 80	25-40
No. 200	8-10



3.0 EXECUTION:

3.1 Preparation:

3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.

3.1.2 Removal of Damaged or Deteriorated Materials:

3.1.2.1 Cleaning for Crack Filling and Slurry Seals: The area shall be swept with stiff bristle brooms and blown clean. Cracks shall be cleaned to the maximum depth possible and made free from any dirt, stones, or other foreign matter.

3.1.2.2 Removal of Deteriorated Material for Patching: Areas to be patched shall extend a minimum of 1 foot into sound surfacing around the perimeter. Saw cut to minimum 3/4 inch deep along all edges of areas delineated to be patched. Remove loose and unsound material completely to the support structure.

3.1.2.3 Preparation for Waterproofing Structural Deck: Remove existing asphalt wearing course and membrane completely to the support structure. Surface shall be smooth and free from projections that might damage the waterproofing membrane.

3.2 Maintenance and Repair Methods:

3.2.1 Filling and Sealing Cracks: Fill the cracks to within 1/8 inch of the surface with asphalt emulsion slurry. Allow the slurry to cure completely before sealing. Seal cracks with liquid asphalt RC-70. The surface of the sealant shall be sprinkled with dry sand to prevent tracking.

3.2.2 Seal Coating: Spray asphalt emulsion seal coat uniformly over the repair area at the rate of 0.15 to 0.25 gallon per square yard after all cracks in the repair area are filled. Immediately following the application of the asphalt emulsion, spread seal coat aggregate uniformly over the treated surface at the rate of 15 to 25 pounds per square yard. Compact by rolling the entire surface. Upon the completion of the work, no loose aggregate shall be allowed to remain on the surface. Allow the sealed area to cure thoroughly before opening to traffic.

3.2.3 Slurry Seal Coating: Where cracks exceed 1 inch in depth or 1/2 inch in width, or both, they shall be filled with the slurry mixture and allowed to cure before placing the slurry seal. Place slurry mixture evenly over area to be sealed. Final thickness of the slurry seal shall be between 1/16 inch and 1/8 inch. Where two applications of the slurry seal are required, allow the initial application to cure before placing the succeeding application.

3.2.4 Patching Asphalt Concrete Surface:

3.2.4.1 Prime Coat: Prime the entire area of patch, including vertical faces, with liquid asphalt RC-70.

3.2.4.2 Placing and Compacting Asphalt Patch Mix: Place sufficient material in the patch area to ensure that the patch surface will not be below that of the adjacent material after compaction. Where the thickness of the finished compacted patch is greater than 3 inches, spread and compact the mixture in 2 or more layers.

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3.2.5 Waterproofing Structural Deck: The waterproofing membrane system shall consist of a penetrating primer, a built-up coal-tar pitch emulsion membrane with 2 plies of coated glass fabric, and a 1/2-inch asphalt-sand seal protection layer.



SECTION 02576 CRACK SEALING OF ASPHALT CONCRETE PAVEMENTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for crack sealing of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Liquid Asphalt shall comply with ASTM D 2027, Grade MC-250.

2.2 Emulsified Asphalt shall comply with ASTM D 977, Grade MS-2.

2.3 Sealing Compound shall comply with CE-CRD-C527.

2.4 Fine Aggregate shall be natural sand or crusher dust and have a maximum size of not more than 1/8 inch and be free of clay or organic matter.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 All Cracks to be sealed shall be cleaned of dirt and debris.

3.1.2 Crack Cleaning Equipment shall consist of a portable air compressor with hose and nozzles for directing air directly into cracks and stiff bristle brooms.

3.1.3 Heating Equipment for Liquid Asphalt shall be mobile and shall be equipped with an agitating device for stirring material during heating, a thermometer, regulating equipment for heat control, and a gravity-type draw-off valve.

3.1.4 Heating Equipment for Sealing Compound: Unless otherwise required by the manufacturer's recommendations, the equipment shall be mobile and shall consist of double-boiler, agitator-type kettles with oil medium in the outer space for heat transfer. The applicator unit shall be so designed that the sealant will circulate through the delivery hose and return to the inner kettle when not sealing cracks.

3.1.5 Application Equipment shall have a spout or nozzle of such size that the sealing material will be placed in the cracks without entrapping air in cracks or spreading material on adjacent pavement surface.

3.2 Installation:

3.2.1 Sealing Compound: All cracks 1/8 inch wide and wider shall be sealed. The application temperature for sealing compound shall comply with Fed. Spec. SS-S-1401. Cracks 1/2 inch wide and wider shall be filled with a slurry of fine sand and an emulsified asphalt or liquid asphalt. After the slurry has cured, cracks shall be sealed with liquid asphalt or emulsified asphalt and lightly sanded.

3.2.2 Liquid and Emulsified Asphalt Sealer: The temperature shall be varied so that it flows freely into cracks and completely fills cracks without entrapping air. Cracks shall be free of moisture before filling and shall be filled slightly above the pavement surface. When excess sealer has been removed, the sealer shall be covered with fine sand.

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3.2.3 Traffic Control: Traffic will not be permitted over sealed cracks until the sealer has cooled so that it is not picked up by vehicle tires. The Contractor will be responsible for all barricades and flagmen necessary to control traffic.



SECTION 02577 PATCHING OF ASPHALT CONCRETE PAVEMENTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for patching of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphaltic Concrete:

2.1.1 Hot-Mixed, Hot-Mixed Asphaltic Concrete and Emulsified Asphalt shall comply with requirements of ASTM D 3515.

2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes shall comply with the requirements of Asphalt Institute Specification PM-2.

2.2 Bituminous Prime: Bituminous prime shall comply with ASTM D 2027.

2.3 Base Course: Base course material shall comply with local highway department specification for dense-graded, high-quality material.

2.4 Bituminous Tack Coat: Bituminous tack coat shall comply with ASTM D 2027.

3.0 EXECUTION:

3.1 Preparation of Areas for Patching:

3.1.1 Pot Holes: Trim the perimeter of each hole to a vertical face and back to well-compacted material. Remove material to a depth that provides a uniform well-compacted bottom surface. Remove all loose material resulting from trimming or otherwise existing in the hole. Areas to be repaired are to be dry before repair is started.

3.1.2 Alligator-Cracked and Rutted Areas: The pavement shall be sawed or cut with pavement breakers to a smooth vertical face 1 foot outside of the alligator-cracked areas. Unsatisfactory material shall be removed in a manner not to disturb the sides of the excavated area.

3.1.3 Slippage Areas: Saw a rectangular area around the slippage area that overlaps into the well-bonded material by at least 1 foot. The depth of the saw cut shall be equal to the thickness of the layer of material that is slipping. The surface where slipping is occurring shall be broomed clean and all loose material removed.

3.2 Installation:

3.2.1 Application Temperatures: Application temperatures for all asphalt material shall comply with provisions of the Asphalt Institute Publications and the applicable ASTM.

3.2.2 Base Course: Place base course material in layers not exceeding a compacted thickness of 6 inches. After placing, compact each layer by mechanical compactors to a density of not less than the density of the corresponding layer of the adjacent pavement structure.

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3.2.3 Prime Coat: Prime base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per sq. yd. Bolt excess prime with sand before the surfacing material is applied.

3.2.4 Tack Coat: Give the edges of existing asphaltic concrete or surfaces of Portland cement concrete and asphaltic concrete a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per sq. yd. Allow the material to cure before placing the surfacing material.

3.2.5 Hot-Mixed Asphaltic Concrete: Place the material in layers not exceeding 2-1/2 inches in thickness and compact to a density equal to the density of the adjacent asphaltic concrete.

3.2.6 Stockpiled Cold Mixes: The compacted thickness of each layer of material shall not exceed 2 inches. Before compaction, the material shall be allowed to aerate, if necessary, until the proper amount of cohesion has developed to obtain adequate compaction. When more than one layer is used, each layer shall be thoroughly cured before the succeeding layer is placed.



SECTION 02578 SPRAY APPLICATIONS, SEAL COATS AND SURFACE TREATMENTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the spray applications, seal coats, and surface treatments of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Bituminous Material: Bituminous material shall be liquid asphalt complying with ASTM D 2028, Grade RC-250, or tar complying with ASTM D 490, Grade RT-6.

2.2 Aggregate: Aggregates shall consist of crushed stone, crushed gravel, or crushed slag. The moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Aggregate gradations shall be in compliance with ASTM C 136.

2.3 Construction Equipment:

2.3.1 Bituminous Distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gal/sq yd with a pressure range of from 25 to 75 lb/sq in. and with an allowable variation from any specified rate not exceeding 5 percent.

2.3.2 Single-Pass Surface Treatment Machine shall be capable of distributing the bituminous material and aggregates uniformly in controlled amounts in a single-pass operation over the surface to be sealed.

2.3.3 Heating Equipment for Storage Tanks shall consist of steam coils, hot oil coils, or electrical coils. If steam or hot oil coils are used, the coils must be so designed and maintained that the bituminous material cannot become contaminated.

2.3.4 Power Rollers shall be the self-propelled tandem and three-wheel type rollers, weighing not less than 5 tons and shall be suitable for rolling bituminous pavements.

2.3.5 Self-Propelled Pneumatic-Tired Rollers shall have a total compacting width of not less than 60 inches. The gross weight shall be adjustable within the ranges of 200 to 350 lb/in. of compacting width.

2.3.6 Spreading Equipment: Aggregate spreading equipment shall be adjustable and capable of spreading aggregate at controlled amounts per square yard.

2.3.7 Drags: Broom drags shall consist of brooms mounted on a frame, designed to spread fine aggregate uniformly over the surface of a bituminous pavement. Towing equipment shall have pneumatic tires.

2.3.8 Brooms and Blowers shall be of the power type and shall be suitable for cleaning surfaces of bituminous pavements.

3.0 EXECUTION:

3.1 Preparation of Surface:

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3.1.1 Immediately Before Application of the Spray, all loose material, dirt, clay, or other objectionable material are to be removed from the surface with a power broom or blower supplemented with hand brooms. Correct all deficient areas such as pot holes, depressions, and excessive cracking.

3.1.2 Application of Bituminous Material: Immediately following the preparation of the surface, apply the bituminous material uniformly over the entire surface to be treated. All spots missed by the distributor shall be properly treated with bituminous material.

3.1.3 Application Temperature: Application temperatures for all materials shall comply with provisions of the Asphalt Institute Publications and the applicable ASTMs.

3.2 Installation:

3.2.1 Spreading Aggregate: Application of seal aggregate shall immediately follow the application of bituminous material, and in no case shall the time to application exceed 15 minutes.

3.2.2 Brooming and Rolling: Begin the rolling operations immediately following the application of cover aggregate. Rolling shall be accomplished with pneumatic-tired rollers; steel-wheeled rollers shall be used in a supplementary capacity only. All surplus aggregate shall be swept off the surface and removed not less than 24 hours or more than four days after rolling is completed.



SECTION 02579 SLURRY SEALS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for slurry seals for asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Project materials, design, material proportions, mix composition, and mix property requirements shall comply with current state slurry seal specifications.

3.0 EXECUTION:

3.1 Preparation of Surface:

3.1.1 Cleaning: Clean the existing surface prior to application of a tack coat or slurry seal mixture.

3.1.2 Repair: Repair all unsatisfactory or defective areas prior to application of a tack coat or slurry seal mixture.

3.1.3 Tack Coat: Apply a tack coat, with a bituminous distributor at the rate of 0.05 gal per sq yd., after the surface is repaired and cleaned. The tack coat shall consist of one part emulsion and three parts water and shall be the same type and grade emulsion as used in the slurry seal mixture. The tack shall be cured before application of the slurry seal mixture.

3.2 Installation:

3.2.1 Preparation and Application of Slurry Seal: Mix and apply the slurry seal mixture with a self-propelled continuous flow unit calibrated to accurately deliver and thoroughly mix the required proportion of aggregate, emulsion, water, and mineral filler. Total mixing time shall not exceed four minutes, and no violent mixing shall be permitted. A water fog spray shall immediately precede application of the slurry seal mixture. The slurry seal mixture shall show no signs of segregation during mixing or placing. The slurry seal mixture shall be free of uncoated or oversized aggregate, lumps, or premature breaking of the emulsion when placed. The average thickness of the cured slurry seal, when measured over the pavement surface, shall be 1/4 inch. The slurry seal minimum thickness shall not be less than 1/8 inch.

3.2.2 Drags: The drag shall be of a burlap material and shall be cleaned or replaced to prevent accumulations of slurry seal mix.

3.2.3 Rolling: Roll the slurry seal mix a minimum of five coverages with a pneumatic roller.

3.2.4 Curing: Protect the slurry seal mix from traffic until cured.

3.2.5 Correcting Deficient Areas: Any slurry seal that becomes contaminated, segregated, defective, or damaged before final acceptance by the Contracting Officer shall be removed and replaced by the Contractor.

3.3 Weather Limits: Air and pavement temperatures shall be 60 F and rising prior to the application of the slurry seal mixture.

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SECTION 02580 ASPHALT CURBS

1.0 DESCRIPTION OF WORK: This specification covers construction of asphaltic concrete curbs in conformity with the lines, grades, and dimensions shown on the plans or established by the Contracting Officer. The standard specification for highway construction for the state in which the project is located shall be considered the standard for material, equipment, details, and construction methods as supplemented hereafter.

2.0 PRODUCTS:

2.1 Asphalt Cement: ASTM D 946, penetration grade 60-70 or 85-100.

2.2 Coarse Aggregate: ASTM D 692.

2.3 Fine Aggregate: ASTM D 1073.

2.4 Mineral Filler: ASTM D 242.

2.5 Composition of Mixture: The asphaltic concrete mixture shall consist of aggregates, filler if needed, and asphalt cement combined in such proportions that the composition by weight of the finished mixture shall be within the limits specified by the state in which the project is located.

3.0 EXECUTION: The curb shall be placed in position on a primed surface by means of an approved automatic curb machine which shapes and compacts the mixture to the designated cross section. The placement temperature of the mixture shall be approximately 260 F. Any required joints shall be carefully made in such manner as to ensure a continuous bond between the old and new sections of the curb. The newly laid curb shall be protected from traffic by barricades or other suitable methods until the heat of the asphalt mixture has dissipated. Immediately after the asphalt curb has hardened, it shall be backfilled where required with suitable material.

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SECTION 02581 COLD MILLING OF BITUMINOUS PAVEMENTS

1.0 DESCRIPTION OF WORK: This specification covers the removal of the existing bituminous surface by cold milling to the depths and limits shown on the drawings or as established by the Contracting Officer. It also includes the loading and stockpiling, if required, of the milled material.

2.0 PRODUCTS: (Section not used).

3.0 EXECUTION:

3.1 Equipment, Tools, and Machines:

3.1.1 Cold-Milling Machine: The cold-milling machine shall be a self-propelled machine capable of milling the pavement to a specified depth and smoothness. The milling machine shall have effective means of controlling transverse slope and controlling dust produced during the pavement milling operation. The milling machine shall not cause damage to any part of the pavement structure that is not to be removed.

3.1.2 Cleaning Equipment: All cleaning equipment shall be suitable for removing and cleaning loose material from the pavement surface.

3.2 Grade: The finished mill surfaces shall conform to the lines, grades, and cross sections indicated. Finished surfaces at a juncture with other pavements shall coincide with the finished surfaces of the abutting pavements.

3.3 Preparation of Surface: The pavement surface shall be cleaned of excessive dirt, clay, or other foreign material immediately prior to milling the pavement.

3.4 Milling Operation: Sufficient passes shall be made so that the designated area is milled to the grades and cross sections indicated. Any items, such as manholes, valve boxes, and utility lines, damaged or any pavement that is torn, gouged, broken, or undercut shall be repaired or replaced as directed by the Contracting Officer.



SECTION 02582 BITUMINOUS REJUVENATION

1.0 DESCRIPTION OF WORK: This specification covers the rejuvenation of existing bituminous airfield pavements, roads, streets, parking areas, and other general applications by the use of a chemical rejuvenator.

2.0 PRODUCTS:

2.1 Rejuvenator: The asphalt rejuvenating agent shall be composed of a petroleum resin-oil base uniformly emulsified with water and shall conform to the following physical and chemical requirements:

Property	Test Method	Requirement

Viscosity, S.F. at 77 F, sec.	ASTM D 244	15-40
Residue, % (1).....	ASTM D 244 (Mod.)	60-65(min.)
Sieve Test, %.....	ASTM D 244 (Mod.)	0.10 (max.)
Viscosity @ 140 F, centistokes (2).....	ASTM D 2170	80-500
Flash Point, Cleveland Open Cup(COC), oF (3).....	ASTM D 92	350 (min.)

(1) ASTM D 244 Modified Evaporation Test for percent residue is made by heating 50 gm samples to 300 F until foaming ceases; then cool immediately and calculate results.

(2) Viscosity on residue obtained from evaporation test.

(3) Flash point on residue from evaporation test.

2.2 Aggregate: Gradation of mineral aggregate shall meet the following requirements:

Sieve Designation	Percent by Weight Passing

No. 16	100
No. 30	40-75
No. 50	4-12
No. 100	0-5

3.0 EXECUTION:

3.1 Bituminous Storage Tanks shall be capable of heating the bituminous material under effective and positive control at all times to the required temperature.

3.2 Bituminous Distributor shall be designed and equipped to spray the bituminous material in a uniform double to triple lap at the temperature recommended by the manufacturer, at variable widths, and at readily determined and controlled rates from 0.04 to 0.2 gallons per square yard, plus or minus 5 percent.

3.3 Brooms and Blowers shall be of the power type.

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3.4 Preparation of Surface: Immediately before applying the rejuvenator, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated.

3.5 Application of Rejuvenator: The rejuvenator shall be uniformly applied over the surface at the approved rate with an allowable variation of plus or minus 20 percent. Materials shall be applied at the temperature recommended by the manufacturer.

3.6 Excess Rejuvenator Material: Approved mineral aggregate shall be provided by the Contractor and shall be spread in sufficient quantity to effectively blot up any excess rejuvenator material remaining on the treated pavement surface after 24 hours.

3.7 Insufficient Rejuvenator Material: When it is determined by the Contracting Officer that the actual application rate of the rejuvenator is more than 20 percent below the approved application rate, subsequent application(s) shall be made within 24 hours to ensure adequate penetration into the pavement surface.



SECTION 02583 COLD MIX RECYCLING

1.0 DESCRIPTION OF WORK: This specification covers the cold mix recycling of existing paving and the addition of new materials, as required, or as directed by the Contracting Officer.

2.0 PRODUCTS:

2.1 Aggregates:

2.1.1 General: Aggregates shall consist of material obtained from milling, or removing and crushing the existing in situ material, and/or new aggregate material as needed.

2.1.2 Aggregate Quality and Gradation: Aggregate for bituminous mixture shall be of such size that the material can be spread with a paver to the desired thickness and compacted to meet the specified smoothness, grade, and density requirements. New aggregates shall be approved and be equal to or better than the reclaimed aggregate in quality. Maximum size of new aggregate shall not exceed one-half of the layer thickness and in no case shall the maximum aggregate size exceed 1 inch.

2.2 Bituminous Materials: Bituminous materials, if required, shall be an emulsified asphalt conforming to ASTM D 977 or ASTM D 2397, grade as required.

2.3 Job-Mix Formula: The Job-Mix Formula (JMF) for the recycled mixture will be furnished by the Contractor to the Contracting Officer. The formula will indicate a definite percentage of water and asphalt to be added to the mixture. The JMF will be allowed an asphalt content tolerance of 0.3 percent. The asphalt content may be adjusted by the Contracting Officer to improve paving mixture, without adjustment in contract unit price. When asphalt is added, the optimum asphalt content will be selected to provide the following properties when samples are compacted at 250 F with 75 blows of standard Marshall hammer on each side of the specimen.

Property	Requirement
Stability minimum, pounds	1,800
Flow maximum, 1/100-inch units	16
Voids in total mix, percent	3-5
Voids filled with bitumen, percent	70-80

The water content will be selected to provide maximum density when samples are prepared at the optimum asphalt content and compacted with 75 blows of Marshall hammer at ambient temperature. When no asphalt binder is added to the mixture, the water content will be selected by the Contracting Officer to provide maximum density.

3.0 EXECUTION:

3.1 Preparation of Bituminous Mixtures: The required amount of bituminous material for each batch, or calibrated amount of continuous mixing, shall be introduced into the mixer. Aggregates, asphalt emulsion, and water shall be mixed for 35 seconds or longer, as necessary, to thoroughly coat all particles with bituminous material. When longer mixing time is necessary, additional mixing time shall be determined by the Contracting Officer.

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3.2 Conditioning of Existing Surface: Ruts or soft yielding spots that appear in the existing pavement areas and deviations of surface from requirements specified shall be corrected. An asphalt tack coat shall be applied to all contact surfaces in advance of the recycled overlayment. The asphalt tack shall be placed at an asphalt residue coverage rate of 0.05 gal/sq. yd.

3.3 Placing:

3.3.1 Layer Thickness and Curing: Each layer of compacted mixture shall be no more than 2-1/2 inches in thickness; each layer of bituminous mixture shall be allowed to cure for at least 5 days before placing a succeeding layer.

3.3.2 Compaction of Mixture: Bituminous mixtures shall be rolled until all roller marks are eliminated and a density of at least 86 percent of the theoretical maximum density has been obtained when tested in accordance with MIL-STD-620, Method 101 or ASTM D 2041. When bituminous material is not added to the cold recycled mixture, the material shall be compacted to 100 percent of density determined by MIL-STD-621, Method 100, compaction effort designation CE-55.

3.3.3 Joints: Longitudinal joints shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.

3.3.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a straightedge laid on the surface.



SECTION 02584 CENTRAL PLANT HOT-MIX RECYCLING

1.0 DESCRIPTION OF WORK: This specification covers the central plant hot-mix recycling of existing asphalt concrete intermediate and wearing courses for airfields, heliports, and heavy-duty pavements. The specification also includes the addition of new materials, as required or as directed by the Contracting Officer.

2.0 PRODUCTS:

2.1 Aggregates:

2.1.1 General: Aggregates shall consist of material obtained from milling, or removing and crushing the existing in-situ material, and/or new aggregate material as needed.

2.1.2 Aggregate Quality and Gradation: Aggregate for the bituminous mixture shall be such size that the material can be spread with a paver to the desired thickness and compacted to meet the specified smoothness, grade, and density requirements. New aggregates shall be approved and shall be equal to or better than the reclaimed aggregate in quality. Maximum size of new aggregate shall not exceed one-half of the layer thickness, and in no case shall the maximum aggregate size exceed one inch. Aggregate gradations shall be as prescribed by local usage, with the approval of the Contracting Officer. In order to meet pollution requirements and ensure the recycled mixture is satisfactory, the amount of reclaimed asphalt pavement shall not exceed 60 percent for drum mixers or 50 percent for batch plants.

2.2 Mineral Filler shall conform to ASTM D 242.

2.3 Bituminous Materials:

2.3.1 New Asphalt Cement: The appropriate types and grades of bituminous materials for the anticipated use and climactic environment shall be used. Requirements of ASTM D 946 shall be used to specify penetration-graded asphalt cement, or ASTM D 3381 for viscosity-graded asphalt cement.

2.3.2 Recycled Asphalt Cement: The penetration of asphalt cement recovered from the recycled mixture shall be in accordance with ASTM D 1856 and shall have a penetration between 50 and 70 percent of that specified for the particular region for new asphalt cement, measured in accordance with ASTM D 5.

2.4 Job-Mix Formula (JMF): The JMF for the recycled mixture will be furnished by the Contractor to the Contracting Officer. The formula will indicate the percentage of reclaimed asphalt pavement, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. The requirements for stability, flow, and voids are shown in the following tables for nonabsorptive and absorptive mixtures, respectively.

Nonabsorptive-Aggregate Mixture

Property	Wearing Intermediate	
	Course	Course
Stability minimum, lbs	1,800	1,800
Flow maximum, 1/100-inch units	16	16
Voids total mix, percent	3-5	5-7
Voids filled with bitumen, percent	70-80	50-70

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Absorptive-Aggregate Mixture

Property	Wearing	Intermediate
	Course	Course
Stability minimum, lbs.	1,800	1,800
Flow maximum, 1/100-inch units	16	16
Voids total mix, percent	2-4	4-6
Voids filled with bitumen, percent	75-80	55-75

When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent, the aggregate is designated as nonabsorptive. When the water-absorption value exceeds 2.5 percent as determined by ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive.

3.0 EXECUTION:

3.1 Preparation of Bituminous Mixtures: Aggregates, reclaimed asphalt pavement, mineral filler, bitumen, and recycling agent shall be conveyed into the mixer in proportionate quantities required to meet the JMF. Particles larger than 2 inches shall be removed from the reclaimed asphalt pavement prior to being added to the mixer. Mixing time shall be as required to obtain a uniform coating of the aggregate with the bituminous material. Temperature of bitumen at time of mixing will be specified by the Contracting Officer. Temperature of aggregate and mineral filler in the mixer shall not exceed 325 F when bitumen is added.

3.2 Surface Preparation of Underlying Course: Prior to placing of intermediate or wearing course, the underlying course shall be cleaned of all foreign or objectionable matter. The surface of previously constructed base course shall be sprayed with a prime coat at an asphalt residue coverage rate of 0.25 gal/sq. yd. Contact surfaces of previously constructed pavement, curbs, manholes, and other structures shall be sprayed with a thin tack coat at an asphalt residue coverage rate of 0.05 gal/sq. yd.

3.3 Placing:

3.3.1 Layer Thickness and Curing: A required uncompacted thickness of intermediate course, 7 inches or less, may be spread and compacted in one layer. Where the required thickness of base is more than 7 inches, the mixture shall be spread and compacted in two or more layers. Each layer of compacted mixture for the surface course shall be no more than 2-1/2 inches in thickness. Each layer of bituminous mixture shall be allowed to cure for at least 5 days before placing a succeeding layer.

3.3.2 Compaction of Mixture: Rolling shall begin as soon after placing as the mixture will bear roller without undue displacement. After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 98 to 100.0 percent and a joint density of 96.5 to 100.0 percent of density is obtained. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

3.3.3 Joints: Longitudinal joints shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.

3.3.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a straightedge laid on the surface.



SECTION 02590 PAVEMENT MARKINGS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and replacement of pavement markings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Paint and reflective media shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer, manufacturer's name, formulation number, and directions, all of which shall be plainly legible at time of use. The paint shall be homogeneous and easily stirred to smooth consistency. Paint that is older than one year shall not be used.

2.2 Paint:

2.2.1 Paint for Roads and Streets shall comply with Fed. Spec. TT-P-85, Type I or II; Fed. Spec. TT-P-115, Type I, II, or III; or with Fed. Spec. TT-P-1952.

2.2.2 Paint for Airfields shall comply with Fed. Spec. TT-P-85, Type I or II or with Fed. Spec. TT-P-1952.

2.3 Reflective Media for Roads and Streets shall comply with Fed. Spec. TT-B-1325, Type I, gradation A.

2.4 Thermoplastic Materials shall comply with AASHTO M 249.

2.5 Raised Pavement Markers shall comply with the Federal Highway Administration Manual on Uniform Traffic Control Devices:

2.5.1 Reflective Pavement Markers: Reflective pavement markers shall be of the prismatic reflector type, consisting of a high impact plastic shell filled with a mixture of inert thermosetting compound and filler material.

2.5.2 Nonreflectorized Pavement Markers: Nonreflective pavement markers shall consist of a heat fired, white, vitreous, ceramic base and a heat-fired, opaque, glazed surface to produce the properties in these specifications.

2.6 Adhesive for Installation of Raised Pavement Markers shall comply with AASHTO M 237.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Safety and Protection: Contractor shall assure the least possible obstruction to traffic.

3.1.2 Removal of Existing Pavement Marking: Remove paint, plastic markings, and raised markers by sandblasting, infrared heat, high pressure water, and water or scraping. Heat may be used to augment scraping; however, the underlying pavement shall not be burned.

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3.2 Installation:

3.2.1 Thermoplastic Applicator: Utilize extrusion or spray application equipment for applying thermoplastic material to the pavement. The equipment shall provide for varying widths of traffic markings.

3.2.2 Bead Dispensers: Attach bead dispensers to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line.

3.2.3 Tolerances in Dimensions and in Alignment: The length of the painted segment for skip stripe and the gap between segments may each vary plus or minus one foot, except that over-tolerance and under-tolerance lengths shall approximately compensate.

3.2.4 Protection: Adequate warning signs, flagmen, and necessary precautions for the protection of the wet paint and the safety of the public shall be provided. Cones, rubber "Z" guards or similar protective devices shall be placed along the newly painted stripe to prevent traffic from crossing the wet paint.

3.2.5 Corrective Measures: Stripes that fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected. Drip and spattered paint shall be removed.



SECTION 02661 WATER LINES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Piping for water service lines shall be galvanized steel, polyvinyl chloride (PVC) plastic, polyethylene, polybutylene, or copper tubing. Piping for water distribution and supply lines shall be ductile iron, polyvinyl chloride (PVC) plastic, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, thermosetting reinforced plastic mortar pressure pipe, or reinforced concrete.

2.1 Copper Tubing: ASTM B 88, Type K, annealed, with compression pattern flared joints.

2.2 Ductile Iron Pipe: AWWA C151, 150 psi working pressure. Pipe shall be cement-mortar lined in accordance with AWWA C104. Joints shall conform to AWWA C111. Flanges shall conform to AWWA C115.

2.3 Polyvinyl Chloride (PVC) Plastic Pipe: All pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B, designated as PVC 1120 in ASTM D 1785.

2.3.1 Pipe Less Than 4 Inches in Diameter:

2.3.1.1 Screw Joint: ASTM D 1785, Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure.

2.3.1.2 Elastomeric Gasket Joint: ASTM D 1785, Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure.

2.3.1.3 Solvent Cement Joint: ASTM D 1785 or D 2241, with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

2.3.2 Pipe, 4-Inch through 12-Inch Diameter: Pipe, couplings, and fittings shall conform to the requirements of AWWA C900, Class 150, CIOD pipe dimensions, elastomeric gasket joint.

2.4 Reinforced and Prestressed Concrete Pipe: Steel cylinder reinforced concrete pipe shall conform to AWWA C300, C301, or C303 and shall be designed to withstand a working pressure of not less than 150 psi, with bell and spigot steel joints and gaskets.

2.5 Steel Pipe 3 Inches and Larger, not Galvanized: AWWA C200 with dimensional requirements as given in ANSI B36.10M for pipe 6 inches in diameter and larger, and ASTM A 53 for smaller sizes. Joints shall be mechanical, bell and spigot, or flanged. Pipe shall be coated with coal-tar primer followed by a hot coat of coal-tar enamel, a wrapper of asbestos felt impregnated with coal-tar, and a wrapper of kraft paper or a coat of water-resistant white wash.

2.6 Galvanized Steel Pipe, Less than 3 Inches: ASTM A 53, standard weight, screwed joints.

2.7 Polyethylene Plastic (PE) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and heat fusion fittings shall conform to AWWA C901.

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2.8 Polybutylene Plastic (PB) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and fusion fittings shall conform to AWWA C902.

2.9 Filament Wound Reinforced Thermosetting Resin Pipe (RTRP-I) for Lines 3 Inches and Larger: ASTM D 2996, normal working pressure of 150 psi at 73 F.

2.10 Centrifugally Cast Reinforced Thermosetting Resin Pipe (RTRP-II) for Lines 3 Inches or Larger: ASTM D 2997.

2.11 Reinforced Plastic Mortar Pressure (RPMP) Pipe for Lines 3 Inches or Larger: ASTM D 3517, bell and spigot type joints with elastomeric or mechanical gaskets.

2.12 Filament Wound and Centrifugally Cast Reinforced Thermosetting Resin Pipe and Reinforced Plastic Mortar Pressure Pipe: Pipe shall have a quick burst strength equal to or greater than four times the normal working pressure of the pipe. The quick burst strength test shall conform to the requirements of ASTM D 1599. Joints shall be bell and spigot type with elastomeric gaskets.

2.13 Valves:

2.13.1 Check Valves shall be designed for a minimum working pressure of 150 psi. Valves 2 inches and smaller shall be all bronze with screwed fittings and shall conform to MSS SP-80, Class 150, Types 3 and 4. Valves larger than 2 inches shall be iron body, bronze-mounted with flanged ends, and non-slam type. Flanges shall be the 125-pound type conforming to ANSI B16.1.

2.13.2 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150. Valves 3 inches and larger shall be iron body, bronze-mounted, and shall conform to AWWA C500.

2.13.3 Rubber-Seated Butterfly Valves shall conform to the performance requirements of AWWA C504.

2.13.4 Indicator Post for Valves shall conform to the requirements of NFPA No. 24.

2.14 Fire Hydrants: AWWA C502 or C503.

2.15 Fire Hydrant Hose Houses: NFPA No. 24.

2.16 Disinfection Materials: Liquid chlorine conforming to AWWA B301 or calcium or sodium hypochlorite conforming to AWWA B300.

3.0 EXECUTION:

3.1 Installation:

3.1.1 Water Lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.1.2 Copper Tubing shall not be installed in the same trench with ferrous piping materials.

3.1.3 Roads, Railroads, and Airfields: Sleeves under railroads shall be in accordance with the criteria contained in the Manual for Railway Engineering of the American Railway Engineering Association. Where sleeves are required in all other cases, the pipe sleeve shall be rigid conduit and shall have a



minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided.

3.1.4 Structures: Where water pipe is required to be installed within three feet of existing structures, the water pipe shall be sleeved as required for roads, railroads, and airfields.

3.2 Joint Deflection:

3.2.1 Ductile Iron Pipe: The maximum allowable deflection will be as given in AWWA C600.

3.2.2 Flexible Plastic Pipe: Maximum offset in alignment between adjacent pipe joints shall not exceed 5 degrees.

3.2.3 Reinforced Concrete Pipe: Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, will be 5 degrees.

3.2.4 Steel Pipe: For pipe with bell and spigot rubber gasket joints, maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets will be 5 degrees.

3.3 Placing and Laying:

3.3.1 The Following Codes shall govern pipe installations: RTRP, ASTM D 3839; PE and PB, ASTM D 2774; PVC, AWWA M23.

3.3.2 Pipe Passing Through Walls of valve pits and structures shall be provided with cast-iron wall sleeves.

3.4 Service Lines: Service lines 2 inches and smaller shall be connected to the main by a directly tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Service lines 1-1/2 inches and smaller shall have a service stop. Service lines 2 inches or larger shall have a gate valve.

3.5 Setting of Fire Hydrants: Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Not less than 7 cubic feet of free draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

3.6 Thrust Blocks: Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on waterlines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking or metal tie rods and clamps or lugs.

3.7 Hydrostatic Tests: The pipeline shall be subjected to both a pressure test and a leakage test.

3.7.1 Pressure Test: After the pipe has been installed and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.

3.7.2 Leakage Test: A standard one-hour leakage test shall be performed subsequent to or concurrently with the pressure test and shall meet an allowable leakage rate according to the following formula:

$$L = NDP/K, \text{ where}$$

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L equals the allowable leakage in gallons per hour, N is the number of field joints in the length of pipeline tested, D is the nominal diameter of the pipe in inches, P is the square root of the average test pressure in psig, and K is equal to 7,400.

3.8 Disinfection: Each unit of completed water line shall be disinfected as prescribed by AWWA C651.



SECTION 02665 WATER RESERVOIRS AND TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of elevated water tanks, ground level water tanks, and standpipes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Standpipe, elevated steel water tank, or storage reservoir shall be in accordance with the applicable requirements of AWWA D100 and AWWA D102, except as modified herein.

2.1 Bolts, Anchor Bolts, and Rods for Welded Steel Tanks: ASTM A 307; galvanizing shall conform to ASTM A 153.

2.2 Reinforcing Steel: ASTM A 615, ASTM A 616, or ASTM A 617.

2.3 Plates: ASTM A 36.

2.4 Tubular Shapes: ASTM A 500, Grade B, for cold-formed; ASTM A 501 for hot-formed.

2.5 Design Loads: The following loads shall be considered in the design of tank structures and foundations:

- a. Dead Loads: The unit weights for steel shall be 490 pcf and 144 pcf for concrete.
- b. Live Load: Live load shall be the weight of all liquid when the tank is filled to just overflowing.
- c. Wind Load and Snow Load: The elevated tank shall be designed according to ANSI A58.1 for a wind speed of 100 mph and for a snow load of 25 psf.

3.0 EXECUTION:

3.1 Foundations for the standpipe, reservoir, tank columns and riser, and for the valve chamber shall be constructed of concrete, reinforced where necessary, and designed in accordance with Section 12 of AWWA D100 except as shown or specified herein. Footings shall be designed in accordance with ACI 318 and constructed in conformance with the applicable requirements of SECTION: CONCRETE. The foundation for the reservoir shall be composed of a concrete ring at base of reservoir with bed of gravel under bottom of reservoir. After concrete ring walls are constructed, the gravel fill shall be placed to thickness shown on plans. Well-graded gravel or crushed stone, not exceeding 2 inches in size with no more than 5 percent passing the No. 200 sieve, shall be placed and thoroughly tamped or rolled at a moisture content that will yield a maximum density for the type of compaction equipment used. The material shall have a crowned surface of 1 inch vertical to 10 feet horizontal as a minimum to allow for the settlement and to ensure that tank bottom will be approximately level.

3.2 Anchors: A sufficient number of anchors, designed to prevent overturning of the standpipe, reservoir, or elevated storage tank, when empty, shall be installed. The anchors shall be not less than 1-1/4 inches in diameter and shall be set deep enough to resist the computed uplift. The anchors shall be bent 90 degrees for anchorage in the concrete, or they shall be provided with anchor plates which may be made of scrap plates or structural steel channels. The anchor bolts shall be attached to the cylinder or anchor plates by means of properly designed lugs made of structural steel shapes or bent plates. Factor of safety on

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overturning under design wind load shall be 1.33 minimum. An inverted truncated pyramid of earth with 2 on 1 side slopes above top of footing may be used in determining overturning stability.

3.3 Test of Valves and Piping: After the tank has been erected and the valves and piping installed and before field painting is begun, the valves and piping shall be subjected for 1 hour to a hydrostatic pressure test of 1.33 times the anticipated static pressure at the points of reading when the system is put into operation.

3.4 Disinfection: Comply with requirements of AWWA C652.



Section 02666 Chilled Water Lines

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of chilled water lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Piping and Fitting for Chilled Water Lines:

2.1.1 Pipes to 4 Inches: Steel, welded, Schedule 40, ASTM A 53.

2.1.2 Pipes 6 to 16 Inches: Steel, seamless or ERW, standard weight, ASTM A 53.

2.1.3 Fittings to 1-1/2 Inches: MI, 150-pound, ASTM A 197, screwed ends ANSI B16.3.

2.1.4 Fittings 2 to 16 Inches: Steel, seamless, standard weight, ASTM A 234, butt weld ends, ANSI B16.9.

2.1.5 Unions to 2 Inches: MI, 150-pound, ASTM A 197, screwed ends, brass-to-iron seats.

2.1.6 Unions 2-1/2 to 16 Inches: Flanged.

2.1.7 Flanges 16 Inches and Under: Steel, ASTM A 105 or A 181, 150-pound, slip-on or welding neck type, ANSI B16.5.

2.1.8 Gaskets-Water Service: Red rubber sheet, 1/16 inch thick, ring or full face as required, ASTM D 2000.

2.1.9 Gaskets-Air Service: Compressed asbestos, 1/16 inch thick, ring or full-faced as required, ASTM F 104.

2.2 Shutoff Valves for Chilled Water Lines:

2.2.1 Gate Valves: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 16 inches shall be flanged ends with cast-iron body.

2.2.2 Butterfly Valves: AWWA C504. Size 3 to 16 inches, wafer-flanged ends with cast-iron body.

2.3 Control Valves for Chilled Water Lines:

2.3.1 Globe Valves: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 10 inches shall be flanged ends with cast-iron body.

2.3.2 Angle Valve: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with brass body. Size 2-1/2 to 14 inches shall be flanged ends with cast-iron body.

2.3.3 Butterfly Valve: AWWA C504. Size 3 to 16 inches shall be wafer-flanged with cast-iron body.

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2.4 Check Valves for Chilled Water Lines: MSS SP-80-Class 150, Types 3 & 4. Swing valves shall be size 1/4 to 2 inches, screwed ends with bronze body or size 2-1/2 to 16 inches, flanged ends with bronze body (ASME B16.1, Class 125).

2.5 Preinsulated Pipe Materials:

2.5.1 Foam Insulation: ASTM C 1029. Factory-applied polyurethane foam insulation shall completely fill the annular space between carrier pipe and jacket.

2.5.2 Jacketing Material: Material shall be extruded white polyvinylchloride, conforming to ASTM D 1784.

2.5.3 Joints shall be insulated with polyurethane foam, jacketed with PVC sleeves, and sealed with heat-shrinkable tape.

2.5.4 Fittings shall be insulated with polyurethane foam and jacketed with PVC fittings.

3.0 EXECUTION:

3.1 Preparation: The trench bottom shall be stabilized by overexcavating 6 inches and replaced by fine graded earth or sand. After pipe is assembled in place and prior to testing, a partial backfill shall be accomplished by tamping fine graded earth or sand around the pipe in 6-inch layers to a minimum of 6 inches above the jacket, leaving joints exposed for visual inspection during hydrostatic testing.

3.2 Testing: The joints of the chilled water lines shall be exposed for visual inspection during hydrostatic testing. After testing is complete, joints shall be covered in a similar manner and backfill operation shall proceed.



SECTION 02670 WELL REPAIR

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water wells. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Repair and Replacement Parts shall be clean, free of rust and scale, and of proper size and design for the specific well repair to be made.

3.0 EXECUTION:

3.1 Cement Grout may be hand mixed at the site.

3.2 Level and Re-Sod Area, after heavy equipment has been used or if chemicals have been spilled.

3.3 Abandoned Wells shall be sealed in accordance with AWWA A100.

3.4 Disinfect well, after repair, in accordance with AWWA A100.

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SECTION 02672 WATER WELLS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for drilled and gravel packed water wells. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the American Water Works Association (AWWA) standards and the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Casings:

2.1.1 Carbon Steel: ASTM A 53 and ASTM A 139.

2.1.2 Stainless Steel: ASTM A 409.

2.1.3 Plastic: ASTM F 480.

2.2 Screens: Stainless Steel ASTM A 304.

2.3 Gravel Packs: AWWA A100, Sections 6.3, 6.4, and 6.5.

2.4 Sealing Grout: AWWA A100, Sections 7.2 and 7.3.

3.0 EXECUTION:

3.1 General: Construction shall be in accordance with the latest edition of AWWA A100 in its entirety including appendices. The standard shall not only cover 8-inch drilled wells and gravel packed wells but the criteria shall also be applied to 4-inch to 6-inch diameter wells.

3.2 Drilling: The method of drilling shall be approved by the Contracting Officer.

3.3 Drilling Samples: Samples of formations shall be retained by the Contractor during drilling with full access by the Contracting Officer. Additional samples shall be taken as directed by the Contracting Officer. Drilling samples shall be delivered to the Government at the completion of the well installation as directed.

3.4 Reports: Geophysical logging and drillers log report shall be required as directed by the Contracting Officer.

3.5 Casing Size: Casing diameter and wall thickness shall be as determined by Tables 2 and 3 of AWWA A100 but in no case shall the wall thickness be less than 1/4 inch (or Schedule 40 for 4-inch pipe).

3.6 Screen Size: The screen diameter, length, and grid openings shall be as required by the aquifer but in no case shall the entrance velocity exceed 1.5 fps. Screen construction shall be approved by the Contracting Officer.



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3.7 Constant Flow Rate: The Contracting Officer will determine the constant flow rate test level based on information from the step-drawdown tests considering the recommendation of the Contractor.



SECTION 02685 GAS DISTRIBUTION LINES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of gas distribution lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Piping for Gas Distribution Lines: Piping shall be steel, Schedule 40, ASTM A 53 or polyethylene, ASTM D 1248 and ASTM D 2513. Pipe designations shall be PE 2306 and PE 3306, designated for gas distribution.

2.2 Fittings for Steel Pipe:

2.2.1 Threaded: Fed. Spec. WW-P-521, Type I, black.

2.2.2 Welded: Butt-welded fittings shall conform to ANSI B16.9. Socket welded fittings shall conform to ANSI B16.11.

2.2.3 Flanged: ANSI B16.5.

2.2.4 Pipe Threads: ASME B1.20.1.

2.3 Valves: Steel Valves 1-1/2 inch and smaller installed underground shall conform to MSS SP-84, carbon steel, socket weld ends, with square wrench operator adaptor. Steel Valves 1-1/2 inch and smaller installed above ground shall conform to MSS SP-84, carbon steel, socket weld or threaded ends with handwheel or wrench operator. Steel valves 2 inches and larger installed under ground shall conform to API Spec 6D, carbon steel, butt welded ends class [] with square wrench operator adaptor. Steel valves 2 inches and larger installed above ground shall conform to API Spec 6D with handwheel or wrench operator.

Polyethylene valves shall conform to ASME B1.40. Polyethylene valves sizes 1/2 inch to 6 inch may be used in polyethylene distribution and service lines in lieu of steel valves for underground installation only.

2.4 Protective Covering for Underground Steel Pipe: A coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar saturated felt, and a wrapper of kraft paper or a coat of water-resistant whitewash shall be applied in accordance with the requirements of AWWA C203.

3.0 EXECUTION:

3.1 Gas Lines: Plastic pipe shall not be installed above ground, in distribution systems that exceed 50 psig, or where operating temperatures of the materials will be below -20 F or above 100 F.

3.2 Installation of Gas Lines shall be in conformance with ANSI B31.8 and, where applicable, IAPMO IS-10.

3.3 Gas Mains shall have a minimum cover of 24 inches, and service lines shall have a minimum cover of 18 inches.

3.4 A Single Conductor No. 14 AWG Wire with type TW insulation shall be installed with plastic pipe to facilitate pipe locating.

3.5 Tests: The distribution system of gas mains and gas service lines shall prove gas-tight by air test under a pressure of 75 psig or not less than 1-1/2 times the operating pressure, whichever is greater.

3.5.1 Test of Gas Mains: The test shall continue for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings shall not be made for at least one hour after the pipe has been subjected to the full test pressure. The testing instruments shall be approved and subject to inspection at all times during the test.

3.5.2 Test of Service Lines: Service lines shall be tested in accordance with ANSI B31.8.



Section 02710 Foundation Drainage Systems

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of foundation drainage systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Clay Pipe: ASTM C 700.

2.2 Perforated Clay Pipe: ASTM C 700.

2.3 Concrete Pipe: ASTM C 14.

2.4 Perforated Concrete Pipe: ASTM C 14 with perforations conforming to ASTM C 444.

2.5 Porous Concrete Pipe: ASTM C 654.

2.6 Clay Drain Tile: ASTM C 4.

2.7 Perforated Clay Drain Tile: ASTM C 498.

2.8 Concrete Drain Tile: ASTM C 412.

2.9 Cast-Iron Soil Pipe: ASTM A 74.

2.10 Perforated Corrugated Steel Pipe: ASTM A 760.

2.11 Perforated Corrugated Aluminum Alloy Pipe: ASTM B 745 - Type III, Class [I][II].

2.12 Perforated Bituminized-Fiber Pipe: ASTM D 2311 or D 2417.

2.13 Perforated Corrugated Polyethylene Drainage Tubing: Soil Conservation Service, Engineering Standard 606.

2.14 Acrylonitrile-Butadiene-Styrene (ABS) Pipe: ASTM D 2751, with a maximum SDR of 35.

2.15 Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, with maximum SDR of 35, and with flexible elastomeric seal joint.

2.16 Fittings: Fittings shall be of compatible materials for pipe.

2.17 Cleanouts: Cleanout pipe and fittings and piping through walls and footings shall be cast-iron soil pipe. Each cleanout shall have a brass ferrule and cast-brass, screw-jointed plug with socket or raised head for wrench.

2.18 Cover and Wrapping Materials for Open Joints in Drain Tile: Tar paper, roofing paper, reinforced building paper, glass fiber fabric, or other similar type material. Wrapping material shall be 18 x 14 mesh, 0.01-inch diameter nonferrous wire cloth.

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3.0 EXECUTION:

3.1 Trenches shall be kept dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Wye fittings shall be used at intersections.

3.2 Bedding: Graded bedding, minimum 6 inches in depth, shall be placed in the bottom of trench for its full width and length. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

3.3 Pipe Laying: Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Perforated pipe shall be laid with perforations facing down.

3.4 Joints:

3.4.1 Perforated and Porous Types of Drain Pipes shall be laid with closed joints.

3.4.2 Non-Perforated and Plain-End Drain Tile shall be laid with 1/8-inch to 1/4-inch open joints. Open joints shall be covered or wrapped.

3.4.3 Joints of Concrete or Clay Sewer Pipe shall be caulked with oakum and filled solid with cement mortar.

3.4.4 Joints of Cast-Iron Pipe or connections between cast-iron and porous concrete pipes shall be caulked with oakum gasket and filled with lead.

3.4.5 Perforated Bituminized-Fiber Pipe Joints in which pipe ends and couplings are tapered shall have a tight-driven fit. Approved split-collar couplings may be used with square-end pipe.

3.4.6 Plain-End Perforated Clay Drain Tile Joints shall be made with spring-wire clips, coated with a rust preventive that will maintain a taut but elastic joint between sections when laid.

3.4.7 Acrylonitrile-Butadiene-Styrene (ABS) Pipe shall be jointed using solvent cement or elastomeric joints.

3.4.8 Polyvinyl Chloride (PVC) Pipe Joints shall be in accordance with ASTM D 3212.

3.5 Outlet Lines: The outlet end of drain lines connecting with an open gutter or outfall shall be covered with a removable wire basket of copper or bronze wire cloth.

3.6 Backfilling: After joints and connections have been inspected and approved, pervious backfill material shall be placed on each side of the pipe or tile and 12 inches above the top of the pipe as shown for the full width of the trench. A protective covering shall be placed over the pervious backfill for the full width of the trench before regular backfill is placed.

3.7 Cleanouts in Unpaved Areas shall be set in 12-inch by 12-inch by 4-inch concrete blocks.



Section 02712 Underslab Drainage

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of underslab drainage. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Pipe shall conform to ASTM C 14.

2.2 Clay Pipe shall conform to ASTM C 700.

2.3 Perforated Clay Pipe shall conform to ASTM C 700. Clips for plain-end pipe shall be constructed of not smaller than No. 9 hard-drawn or oil-tempered steel wire conforming to ASTM A 227 or A 229, and shall be coated with an approved rust preventive coating.

2.4 Perforated Concrete Pipe shall conform to ASTM C 444 and to ASTM C 14.

2.5 Perforated Bituminized Fiber Pipe and Couplings shall conform to ASTM D 2418.

2.6 Perforated Corrugated Steel Pipe shall conform to ASTM A 760.

2.7 Perforated Corrugated Steel Pipe, Fully Bituminous-Coated shall conform to ASTM A760, Type III, with coating conforming to AASHTO M 190, Type A.

2.8 Drain Tile: Clay drain tile shall conform to ASTM C 4. Concrete drain tile shall conform to ASTM C 412.

2.9 Porous Concrete Pipe shall conform to ASTM C 654.

2.10 Galvanized Bituminous-Coated, Semicircular Steel Pipe shall conform to ASTM A 444. Bituminous coating shall be in accordance with AASHTO M 190, Type A.

2.11 Perforated Corrugated Aluminum Alloy Pipe shall conform to ASTM B 745, Type III, Class [1][2].

2.12 Perforated Corrugated Aluminum Alloy Pipe, Fully Bituminous-Coated shall conform to ASTM B 745, Typw III, Class [1][2] with coating conforming to AASHTO M 190, Type A.

2.13 Precoated Corrugated Steel Pipe shall conform to ASTM A 762, Type III.

2.14 Acrylonitrile-Butadiene-Styrene (ABS) Piping shall conform to ASTM D 2751.

2.15 Polyvinyl Chloride (PVC) Pipe and Fittings shall conform to ASTM D 3034, Type PSM, with flexible elastomeric seal joint.

2.16 Filter Fabric shall be a pervious sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measureable openings. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.

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2.17 Drainage Structures: Concrete shall have a minimum strength of 3,000 psi and an air content of 3 to 6 percent. Concrete cover over reinforcing shall be in conformance with ACI 318. Expansion joint filler material shall conform to ASTM D 1751 or D 1752. Mortar shall be composed by volume of one part Portland Cement and two parts sand.

2.18 Precast Reinforced Concrete Manhole Risers and Tops shall conform to ASTM C 478.

2.19 Precast Concrete Segmental Blocks shall conform to ASTM C 139.

2.20 Precast Concrete Manhole Bases shall conform to ASTM C 478.

2.21 Brick shall conform to ASTM C 62 or ASTM C 55.

2.22 Prefabricated Corrugated Metal: Steel manholes and risers shall be fabricated of galvanized and bituminous coated corrugated metal.

2.23 Frames and Covers or Gratings shall be cast gray iron, ASTM A 48, Class 35B or ductile iron, ASTM A 536, Grade 65-45-12.

2.24 Ladders or Ladder Rungs shall be fabricated of cast iron, wrought iron, or galvanized steel.

2.25 Subdrain Filter and Bedding Material shall be washed sand, sand and gravel, crushed stone, crushed stone screenings, or slag composed of hard, tough, durable particles free from adherent coatings.

3.0 EXECUTION:

3.1 Manholes shall be installed complete with frames, ladders, and covers or gratings.

3.2 Filter Fabric: One layer of filter fabric shall be wrapped around open joints and perforated or slotted collector pipes. Trenches to be lined with filter fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock.

3.3 Pipelaying: The laying of pipe shall proceed upgrade beginning at the lower end of the pipeline. Pipe shall not be laid in water. Pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe.

3.4 Jointing:

3.4.1 Nonperforated Concrete and Clay Pipe: Pipe shall be laid with 1/8- to 1/4-inch openings between ends of pipe.

3.4.2 Perforated Concrete and Clay Pipe: Pipe shall be laid with closed joints. Plain-end perforated clay pipe sections shall be fastened together with spring wire clips furnished by the pipe manufacturer.

3.4.3 Perforated Bituminized-Fiber Pipe: Pipe shall be installed with either a tapered coupling or a split-collar coupling.

3.4.4 Perforated Corrugated Metal Pipe, or Unpaved Bituminous-Coated, Perforated Corrugated Metal Pipe: The sections of pipe shall be securely fastened together with standard connecting bands furnished by the manufacturer of the pipe.



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3.4.5 Drain Tile: Drain tile shall be laid with open joints of approximately 1/8-inch width but not over 1/4-inch width.

3.4.6 Porous Concrete Pipe: Pipe shall be installed with mortar joints.

3.4.7 Bituminous-Coated or Uncoated Semicircular Steel Pipe: Coupling bands shall consist of uncorrugated top and bottom sections bolted together with four bolts.

3.4.8 Bituminous-Coated or Uncoated Corrugated Aluminum Pipe: Use standard connecting bands furnished by the pipe manufacturer.

3.4.9 Acrylonitrile-Butadiene-Styrene (ABS): Solvent cement or elastomeric joints for ABS pipe shall be in accordance with ASTM D 2751.

3.4.10 Polyvinyl Chloride (PVC) Pipe: Joints shall be in accordance with the requirements of ASTM D 3212.

3.5 Backfilling: Filter material shall be placed around and over the pipe. The remainder of the trench shall be filled with overlying backfill material.



Section 02720 Storm Drains

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of storm drains. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Reinforced Concrete Pipe: ASTM C 76 or AASHTO M 170.

2.2 Reinforced Concrete Arch Culvert and Storm Drainpipe: ASTM C 506.

2.3 Reinforced Concrete Elliptical Culvert and Storm Drainpipe: ASTM C 507.

2.4 Nonreinforced Concrete Pipe: ASTM C 14 or AASHTO M 86, Class 1, Class 2, Class 3.

2.5 Reinforced Concrete Box Sections: ACI 346.

2.6 Clay Pipe: AASHTO M 65 or ASTM C 700.

2.7 Corrugated Steel Pipe, Pipe Arch, and Couplings: Pipe and couplings shall conform to ASTM A 760.

2.8 Structural-Plate Steel Pipe, Pipe Arches, and Arches: Plate and bolted assembly shall conform to AASHTO M 167, coating shall conform to AASHTO M 190 Type A or AASHTO M 243.

2.9 Corrugated Aluminum Alloy Pipe, Pipe Arch, and Underdrains: Pipe shall conform to AASHTO B 745.

2.10 Structural-Plate Aluminum Pipe, Pipe Arches, and Arches: Plate and bolted assembly shall conform to AASHTO M 219, coating shall conform to AASHTO M 190 Type A or AASHTO M 243.

2.11 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings: ASTM D 2751.

2.12 Reinforced Plastic Mortar (RPMP) Sewer Pipe: ASTM D 2992.

2.13 Precast Reinforced Concrete Manholes: ASTM C 478 or AASHTO M 199.

2.14 Reinforced Plastic Mortar (RPM) Manholes: ASTM D 3840.

2.15 Corrugated Polyethylene (PE) Plastic Manholes: ASTM D 3753.

2.16 Glass Fiber-Reinforced Polyester Manholes: ASTM D 3841.

2.17 Prefabricated Corrugated Metal Inlets and Manholes: Manholes and inlets shall be complete with frames and covers, or frames and gratings.

2.18 Manhole Ladders or Steps shall be fabricated of steel or heavy-duty aluminum, minimum 16 inches in width with 3/4-inch diameter or square rungs on 12-inch centers. Steel ladders and inserts shall be galvanized after fabrication.



2.19 Precast Concrete Segmental Blocks shall conform to ASTM C 139, and shall be not more than 8 inches thick nor less than 8 inches long.

2.20 Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II, or ASTM C 32, Grade MS. Brick structures shall be plastered with 1/2-inch of mortar over the entire outside surface of the walls.

2.21 Walls and Headwalls shall be reinforced concrete, plain concrete, or steel sheeting as indicated.

2.22 Flared End Sections shall be a standard design with pipe manufacturer and manufactured of the same material as specified for the pipe.

2.23 Concrete for Structures: ACI 318.

2.24 Mortar shall be composed of Portland cement, Portland blast-furnace slag, Portland-pozzolan, or masonry cement, as available.

3.0 EXECUTION:

3.1 Excavation:

3.1.1 Trenches: Except where banks are cut back on a stable slope, excavation for trenches shall be sheeted, braced, and shored as necessary for proper laying of pipe. Care shall be taken not to overexcavate. Remove stones as necessary to avoid point bearing.

3.1.2 Storm Sewers: The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.

3.1.3 Appurtenances: Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks.

3.2 Backfilling:

3.2.1 Trenches: Backfill trenches to finish grade with satisfactory materials. Replace pavement, base course, and compact subgrade disturbed by trenching operations in an acceptable manner with materials equal to the adjacent compacted subgrade, base course, and pavement for a minimum distance of 12 inches on each side of the trench and conform to the requirements hereinafter specified.

3.2.2 Lower Portion of Trench: Deposit backfill material in 6-inch maximum thickness layers and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24 inches over lines, unless otherwise noted. The backfill material in this portion of the trench shall be free from stones larger than 3 inches in any dimension and hard clods and conglomerates larger than 6 inches in any dimension.

3.2.3 Remainder of Trench: Except for special materials for pavements and railroads, backfill the remainder of the trench with material that is free of stones larger than 6 inches or 1/2 the layer thickness, whichever is smaller, in any dimension. Deposit backfill material in layers not exceeding the thickness specified.

3.3 Installation:

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3.3.1 General: Under no circumstances shall pipe be laid in water. No pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.3.2 Plastic Pipe and Manholes: Install plastic pipe and manholes in compliance with ASTM D 2321, ASTM D 3753, and ASTM D 3839.

3.3.3 Concrete and Clay Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow.

3.3.4 Circular Concrete Pipe with Elliptical Reinforcing: Placement shall be such that reference lines designating top of pipes will not be more than 5 degrees from the vertical plane through the longitudinal axis of the pipe.

3.3.5 Corrugated Metal Pipe and Pipe Arch: Laying shall be with the separate sections joined firmly together with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Suitable markings or properly placed lifting lugs shall be provided to ensure placement of factory elongated pipe in a vertical plane.

3.3.6 Structural-Plate Steel Pipe, Pipe Arches, and Arches: Tighten bolts on each section progressively and uniformly, starting at one end of the structure after all plates are in place. Repeat the operation to ensure that all bolts are tightened to meet the torque requirement of 200 foot-pounds, plus or minus 50 foot-pounds.

3.3.7 Structural-Plate Aluminum Pipe, Pipe Arches, and Arches: Tighten bolts on each plate progressively and uniformly, starting at one end of the structure after all plates are in place. Repeat the operation to ensure that all bolts are torqued to a minimum of 100 foot-pounds on aluminum alloy bolts and a minimum of 150 foot-pounds on galvanized steel bolts.

3.3.8 Manhole Ladders: Install manhole ladders when the manhole depth exceeds 12 feet. Anchor ladders adequately to the wall by means of steel inserts spaced not more than 6 feet apart vertically. Provide at least 6-1/2 inches of space between wall and inside of rungs.



SECTION 02724 FORCE MAINS AND INVERTED SIPHONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of force mains and inverted siphons. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Piping for force mains shall be ductile iron, steel, polyvinyl chloride (PVC) plastic, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, thermo-setting reinforced plastic mortar pressure pipe, or reinforced concrete.

2.1 Ductile Iron Pipe: AWWA C151, 150 psi working pressure. Pipe shall be cement mortar-lined in accordance with AWWA C104. Joints shall conform to AWWA C111. Flanges shall conform to AWWA C115.

2.2 Polyvinyl chloride (PVC) Plastic Pipe: All pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B, designated as PVC 1120 in ASTM D 1785.

2.3 Reinforced and Prestressed Concrete Pipe: Steel cylinder reinforced concrete pipe shall conform to AWWA C300, C301, or C303 and shall be designed to withstand a working pressure of not less than 150 psi, with bell and spigot steel joints and gaskets.

2.4 Steel Pipe 3 Inches and Larger, not Galvanized: AWWA C200 with dimensional requirements as given in ANSI B36.10 for pipe 6 inches in diameter and larger, and ASTM A 53 for smaller sizes. Joints shall be mechanical, bell and spigot, or flanged.

2.5 Filament Wound Reinforced Thermosetting Resin Pipe (RTRP-I) for Lines 3 Inches and Larger: Pipe shall conform to ASTM D 2996. The pipe shall be suitable for a normal working pressure of 150 psi at 73 F.

2.6 Centrifugally Cast Reinforced Thermosetting Resin Pipe (RTRP-II) for Lines 3 Inches or Larger: Pipe shall conform to ASTM D 2997.

2.7 Reinforced Plastic Mortar Pressure (RPMP) Pipe for Lines 3 Inches or Larger: Pipe shall conform to ASTM D 3517. Joints shall be bell and spigot type with elastomeric or mechanical gaskets.

2.8 Valves:

2.8.1 Check Valves shall be designed for a minimum working pressure of 150 psi. Valves larger than 2 inches shall be iron body, bronze-mounted, shall have flanged ends, and shall be the non-slam type. Flanges shall be the 125-pound type conforming to ANSI B16.1.

2.8.2 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150. Valves 3 inches and larger shall be iron body, bronze-mounted, and shall conform to AWWA C500.

2.8.3 Rubber-Seated Butterfly Valves shall conform to the performance requirements of AWWA C504.

2.8.4 Plug Valves: Cast-iron valves shall comply with MSS SP-78. Steel plug valves shall comply with API Spec. 6D.

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2.8.5 Pinch Valves shall be double-acting, jam-proof type with unobstructed streamlined flows and built-in operator. The valve shall have flanged ends. Flanges shall be of the 125-pound type complying with ANSI B16.1.

2.8.6 Air Release Valves shall be attached by means of threaded pipe connections.

2.8.6.1 Manual Air Release Valves shall consist of a 3-inch gate valve and 3-inch ductile iron pipe and fittings.

2.8.6.2 Automatic Air Release Valves shall be of the compound lever type capable of withstanding operating pressures of 150 psi.

2.9 Valve Boxes shall be cast iron or concrete. Only concrete boxes will be acceptable in roadways or in areas subject to heavy loads.

2.10 Valve Vaults: Precast concrete units conforming to ASTM C 478.

3.0 EXECUTION:

3.1 Utility Separation: Pressure sewer pipe and water pipe shall be separated by at least 10 feet horizontally.

3.2 Placing and Laying:

3.2.1 RTRP Pipe shall be installed in accordance with ASTM D 3839. PVC shall be installed in accordance with AWWA M23.

3.2.2 Pipe Passing Through Walls of valve pits and structures shall be provided with cast-iron wall sleeves.

3.3 Thrust Blocks: Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on waterlines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking or metal tie rods and clamps or lugs.

3.4 Hydrostatic Tests: The pipeline shall be subjected to both a pressure test and a leakage test.

3.4.1 Pressure Test: After the pipe has been installed and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.

3.4.2 Leakage Test: A standard one-hour leakage test shall be performed subsequent to or concurrently with the pressure test and shall meet an allowable leakage rate according to the following formula:

$$L = NDP/K, \text{ where}$$

L equals the allowable leakage in gallons per hour, N is the number of field joints in the length of pipeline tested, D is the nominal diameter of the pipe in inches, P is the square root of the average test pressure in psig, and K is equal to 7,400.



SECTION 02725 SAND DRAINS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sand drains. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Galvanized Perforated Corrugated Metal Pipe: AASHTO M36.

2.2 Perforated Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1784.

2.3 Aggregate shall be sand, gravel, crushed rock, or chat that is clean, sound, and of a good quality. Gradation shall conform to the following table:

Retained on the 1-inch sieve	0%
Retained on the 3/8-inch sieve	0-15%
Retained on the No. 8 sieve	40-60%
Retained on the No. 30 sieve	70-95%
Retained on the No. 100 sieve	98-100%

3.0 EXECUTION:

3.1 Pipe Bedding: Aggregate shall be placed in uniform layers on level excavation.

3.2 Perforated Pipe shall be laid with securely aligned joints to lines and grades, which will allow proper drainage.

3.3 Perforated Pipe shall be embedded with a minimum coverage of two feet of aggregate or as directed.



SECTION 02726 WASTEWATER COLLECTION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of wastewater collection systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Bituminized Fiber Pipe and Fittings: ASTM D 1861, except that wye branches and tees may be vitrified clay, concrete, or cast iron.

2.2 Cast-Iron Soil Pipe and Fittings: ASTM A 74, Class SV or XH. Acid-resistant lines shall be Class XH and contain not less than 12 percent silicon.

2.2.1 Rubber Gaskets for Compression Joints: ASTM C 564.

2.2.2 Caulked Joints: Joint packing material shall be twisted jute or oakum, tarred type. Lead shall comply with Fed. Spec. QQ-C-40.

2.3 Clay Pipe and Fittings: Clay Pipe and Fittings shall conform to ASTM C 700. Compression Joints shall conform to ASTM C 425.

2.4 Concrete Pipe: 24 inches in diameter or less, nonreinforced, ASTM C 14, Class 1; greater than 24 inches in diameter, reinforced, ASTM C 76.

2.4.1 Joints less than 36 inches in diameter shall be bell and spigot type; pipe 36 inches or greater in diameter shall be bell and spigot type, tongue and groove type, or modified tongue and groove type. Joints and gaskets shall conform to ASTM C 443.

2.4.2 Portland Cement for Concrete Pipe and Fittings: ASTM C 150, Type IIA or V.

2.5 Plastic Pipe: Plastic pipe shall not be used for sewers larger than 15 inches in diameter.

2.5.1 Acrylonitrile-Butadiene-Styrene (ABS) Composite Piping: ASTM D 2680, Type SC or Type OR, size 8 inches through 15 inches in diameter.

2.5.2 Acrylonitrile-Butadiene-Styrene (ABS) Pipe and Fittings: ASTM D 2751, solvent weld or bell and spigot O-ring joint, size 12 inches or less in diameter.

2.5.3 Polyvinyl Chloride (PVC) Pipe and Fittings: ASTM D 3034, Type PSM with a maximum SDR of 35, size 15 inches or less in diameter, with flexible elastomeric seal joint, elastomeric gasket joint in accordance with ASTM D 3212.

2.5.4 Branch Connections: Branch connections shall be made by use of regular fittings or solvent cemented saddles. Saddles for acrylonitrile-butadiene-styrene (ABS) composite pipe shall comply with Figure 2 of ASTM D 2680, saddles for acrylonitrile-butadiene-styrene (ABS) pipe shall comply with Table 3 of ASTM D 2751, and saddles for polyvinyl chloride (PVC) pipe shall comply with Table 4 of ASTM D 3034.



2.6 Clay Pipe: Standard strength pipe shall conform to AASHTO M 65. Extra strength pipe shall conform to AASHTO M 65 or ASTM C 700. Compression fittings shall comply with ASTM C 425.

2.7 Reinforced Plastic Mortar Pipe: ASTM D 3262. Fittings shall be in accordance with ASTM D 3840. Joints shall be bell and spigot type utilizing an elastomeric gasket.

2.8 Brick for Manholes: ASTM C 62, Grade SW, or ASTM C 32, Grade MS.

2.9 Cement Mortar: ASTM C 270, Type M. Use Type IIA cement.

2.10 Concrete Blocks for Manholes: ASTM C 139.

2.11 Portland Cement: ASTM C 150, Type IIA or V.

2.12 Concrete: ASTM C 94, compressive strength of 4,000 psi.

2.13 Precast Reinforced Concrete Manhole Sections: ASTM C 478.

3.0 EXECUTION:

3.1 Adjacent Facilities: Unless otherwise dimensioned, the sewer shall not be closer horizontally than ten feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least twelve inches above the top of the sewer pipe, the horizontal spacing may be a minimum of six feet. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of ten feet on each side of the crossing shall be fully encased in 4 inches of concrete or shall be acceptable pressure pipe with no joint closer horizontally than three feet to the crossing.

3.1.1 Roads, Railroads, and Airfields: Sewer pipe shall be suitably encased in a sleeve of rigid conduit under primary access road crossings, railroad crossings, and at airfield runways and taxiways where aircraft are moved under their own power.

3.1.2 Structures: Where sewer pipe is required to be installed within three feet of an existing building or structural foundation, the sewer pipe shall be sleeved. 3.2 Pipe Laying: Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow.

3.3 Leakage Tests: Lines shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Leakage shall not exceed 0.2 gallons per inch diameter per 100 feet of pipeline per hour.

3.4 Test for Deflection: When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline upon completion of all work, including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads.

3.5 Building Connections shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building.

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Section 02727 Erosion Control

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mesh or netting for erosion control. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Jute Mesh: Fed. Spec. CCC-C-467.

2.2 Plastic Mesh: Manufacturer's recommendation.

2.3 Plastic Netting: Manufacturer's recommendation.

2.4 Polypropylene Mesh: Manufacturer's recommendation.

3.0 EXECUTION:

3.1 Preparation: Grade, compact, fertilize, and seed the area to be protected.

3.2 Installation: Apply blankets either horizontally or vertically to the slope. In ditches, apply blanket in direction of water flow. Lap and anchor blankets according to the manufacturer's instructions.



SECTION 02730 SEWER LINE MANHOLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewer line manholes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: All materials shall be clean, free of defects, corrosion, and damage. All items shall be of proper type, size, design, and characteristics for the use intended. Unless otherwise specified, all items shall be factory made.

2.2 Manhole Brick: Bricks used in the repair of manholes shall comply with ASTM C 32, Grade MS.

2.3 Concrete used in the repair of manholes shall comply with ASTM C 94 with compressive strength of 3,000 psi.

2.4 Portland Cement shall comply with ASTM C 150, Type 5.

2.5 Concrete Blocks for manhole repair shall comply with ASTM C 139, of the size required to match prevailing conditions.

2.6 Cement Mortar shall comply with ASTM C 270, Type M.

2.7 Precast Concrete Sections for manhole repair shall comply with ASTM C 478, utilizing Portland cement.

2.8 Manhole Steps shall be of cast iron construction in compliance with ASTM A 48, Class 20-B or ASTM A 536, with a minimum tensile strength of 35,000 psi.

2.9 Grout shall be of Portland cement, metallic or nonmetallic, nonshrink or expansive type, complying with ASTM C 476 or ASTM C 658.

2.10 Epoxy Mortar shall be utilized to fill all deteriorated joints of brick manholes.

2.11 Castings shall be gray iron, complying with ASTM A 48, Class 20B, or ductile iron, complying with ASTM A 536.

2.12 Frames and Covers shall be for light-duty traffic, with 24-inch entrance diameter, anchored to the manhole structure.

2.12.1 Waterproof Frame and Cover shall be gasket sealed with bolts for lid and shall comply with "Frames and Covers," above. Bolts and nuts shall be steel.

2.12.2 Replacement Covers shall be solid, flat top, of the proper design and load rating, and fit the existing frame without need for adaptors or additional hardware.

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2.12.3 Cover Height Adjustment Devices shall be expandable to fit the frame rim size and adjustable vertically to match the required finished grade elevation.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Cleaning Existing Surfaces: Prior to applying grout, scrape surfaces of all loose material, dry of excess water, and clean of organics, slimes, or dust.

3.1.2 Manhole Crack Preparation: Drill holes in cracks at the extreme ends and at 6- to 9-inch intervals with a masonry bit.

3.2 Installation:

3.2.1 Grouting, Interior of Manhole: Grout and seal interior wall of manhole by hand application, giving a trowel finish.

3.2.2 Grouting, Exterior of Manhole: If pressure grouting from ground surface, insert applicator directly above area to be grouted and inject grout until grout enters manhole through crack. If pressure grouting from inside manhole, insert grout applicator at each drilled hole along the crack and repeatedly pump until grout emerges through the crack and annular space between hole and applicator.

3.2.3 Curing of Grout: Cure Portland cement grout in a damp atmosphere by closing all entrances to the manhole.



SECTION 02735 SEWER LINE GROUTING

1.0 DESCRIPTION OF WORK: This specification covers sewer line grouting. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Grout shall be applicable to sewer conditions and as required to seal the pipe from leaks. Type of grout used shall be compatible with the soil and moisture conditions and shall provide watertight seals under all internal and external conditions to which the sewer shall be subjected.

2.2 Chemical Grout shall be acrylamide gel or polyurethane foam.

2.2.1 Acrylamide Gel shall be an aqueous solution of acrylamide and N,N' methylenebisacrylamide powders, with the proper catalyst, such as B-dimethylaminopropionitrile and ammonium persulfate, mixed in the proper proportions and concentrations to achieve the desired results, depending on the field conditions.

2.2.2 Polyurethane Foam Grout shall be an aqueous solution of liquid urethane polymer, with a water-soluble amine accelerator.

2.3 Epoxy Mortar Grout shall comply with ANSI A118.3.

2.4 Portland Cement Grout shall comply with ASTM C 476.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Alternate Sewage Discharge shall be provided to a downstream manhole.

3.1.2 Preparatory Cleaning: Prior to beginning of grouting work, sewers to be repaired shall be cleaned of all debris, sediments, and tuberculation.

3.2 Installation:

3.2.1 Grouting shall take place at all joints determined to require repair and at cracks and crevices where infiltration or exfiltration is occurring or has a possibility of occurring.

3.2.2 Grouting of Lateral Connections and Manhold External Drops shall consist of pumping grout to fill the entire length of the lateral pipe and manhole drops until the grout exfiltrates through the various leaks. Allowing for proper grout setting time, ream the grouted pipe of excess grout in its entirety. Remove all excess grout without being discharged in the main sewer and dispose of properly.

3.2.3 Manual Grout Application: Grout large sewers allowing the physical entrance of personnel utilizing probe-type applications and injecting the grout material directly in the leaks or through holes drilled at the leaks. Grouting shall continue until all leaks are stopped.

3.2.4 Testing of Grouted Sewers:

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3.2.4.1 Air Testing of each individual joint and crevice shall be conducted upon setting of the in-place grout. The test shall be for not less than 30 seconds at each location, at pressures greater than or equal to the hydrostatic head caused by the maximum expected groundwater elevation. Record pressures at each location at five second intervals with an accuracy of 0.05 psi. Repair locations having pressure drops due to air leaks using grout or another approved method, until all leaks are stopped. Retest location after repairs are made.

3.2.4.2 Hydrostatic Testing:

3.2.4.2.1 Upon completion of grouting a section of sewer, the line shall be hydrostatically tested for leaks. Repair leaks using grout or another approved method, until all leaks are stopped. Retest line section after repairs are made.

3.2.4.2.2 Infiltration and Exfiltration Leakage into or out of the sewer shall not exceed the equivalent of 100 gallons per day, per inch of diameter, per mile of sewer from any section between successive manholes. The infiltration test may be used when the ground water is at least 2 feet higher than the pipe crown. Measure leakage with a weir. The exfiltration test shall consist of plugging successive upstream manholes and service connections and filling of line from the upstream manhole with water to a depth of 2 feet or more above the pipe crown or the ground water, whichever is higher.

3.2.4.3 Pneumatic Testing: Upon completion of grouting a section of sewers, the line shall be pneumatically tested for leaks in compliance with ASTM C 828. Repair leaks using grout or another approved method, until all leaks are stopped. Retest line section after repairs are made.

3.2.5 Performance of Grouted Sewers: Grouted sewer lines shall have no more than 100 gallons per inch diameter per mile of sewer per day, infiltration or exfiltration, upon completion of the work. RegROUT sections of sewers experiencing more than the allowable leakage or otherwise repair by approved methods.



SECTION 02737 SEWER LINE CLEANING

1.0 DESCRIPTION OF WORK: This specification covers sewer line cleaning. Cleaning procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: All materials shall be clean, free of defects, corrosion, and damage. All items shall be of proper type, size, design, and characteristics for the use intended. Unless otherwise specified, all items shall be factory-made.

2.1 Portable Cleaning Equipment: Equipment used in the cleaning of sewer lines shall be as required to complete the work for the size, length, and conditions of the sewer. Portable and mobile equipment shall comply with Water Pollution Control Federation Manual of Practice No. 7.

2.2 Chemicals shall be of the strength required to perform the work. The chemicals shall not be damaging to pipe materials, manholes, pumping equipment, nor treatment process and shall not be contaminated by foreign substances.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Protection required to prevent damage to adjacent materials, equipment, fixtures, and finishes shall be provided. Necessary protective clothing and accessories for personnel working with chemicals shall be provided.

3.1.2 Ventilation of Sewers: Contractor shall provide proper ventilation for personnel working in the sewer.

3.1.3 Alternate Sewage Discharge: Contractor shall provide an alternate routing of sewage discharge to a downstream manhole.

3.1.4 Traffic: Contractor shall provide all traffic signs required to safely direct traffic at and around work areas.

3.2 Installation:

3.2.1 Direction of Work: Sewer line cleaning work, with the exception of hydraulic scouring, shall proceed in the downstream direction. Cleaning by hydraulic scouring shall proceed in the upstream direction.

3.2.2 Testing: Upon completion of cleaning operation, test sewer lines for proper operation and observe for a period of 24 hours. Clean out all stoppages and the retest the line for proper operation.

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Section 02740 Septic Tanks And Grease Traps

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of septic tanks and grease traps. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Concrete Repair Material shall be epoxy type grout in compliance with Fed. Spec. MMM-A-001993.

3.0 EXECUTION:

3.1 Septic Tanks and Grease Traps shall be drained and cleaned.

3.2 Adequate Ventilation shall be provided and precautions against the presence of explosive vapors shall be taken if it is necessary to enter the septic tank.

3.3 Soil Absorption System: Remove and dispose of vegetation roots impeding the flow of water in the soil absorption system properly. Restore all noticeable irregularities in the ground surface, caused by removal, by filling with soil that matches surrounding soil.

3.4 Filling Abandoned Septic Tanks and Grease Traps: Clean and fill abandoned septic tanks and grease traps with compacted soil.



SECTION 02742 SIPHON TANK AND SIPHONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant dosing siphon tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Tank Repair Material shall be epoxy type grout complying with Fed. Spec. MMM-A-001993.

2.2 Concrete Coatings:

2.2.1 Outside and Above Grade shall be epoxy type in compliance with Mil. Spec. MIL-P-24441.

2.2.2 Inside and Below Grade shall be coal-tar epoxy type in compliance with SSPC-PAINT 16.

2.3 Steel Repair Material shall be steel plate or epoxy cement and fiberglass cloth.

2.4 Corroded or Defective Siphons: Replace those parts corroded or defective with new parts compatible with the unit, as recommended by the manufacturer.

2.5 Steel Coatings:

2.5.1 Red-Lead Base Coat shall comply with Fed. Spec. TT-P-86, Type I.

2.5.2 Aluminum Paint shall comply with Fed. Spec. TT-P-38.

3.0 EXECUTION:

3.1 Corroded or Broken Pipe and Fittings: Replace as required.

3.2 Minor Leaks: Repair minor leaks in the tank using material and surface preparation and application methods recommended by the material manufacturer.

3.3 Spalled Areas: Repair as required.

3.4 Cleaning and Coating:

3.4.1 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.

3.4.2 The Exterior Concrete Surfaces of the tank shall be cleaned by means of brush sandblasting in compliance with SSPC-SP 7. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint shall be applied.

3.4.3 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing material shall be allowed to cure overnight, and then two coats of coal-tar epoxy complying with SSPC-PAINT 16 shall be applied.

3.4.4 Submerged Ferrous Metal Surfaces that are exposed to the sewage shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.

3.4.5 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of aluminum finish paint shall be applied.

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SECTION 02744 GREASE INTERCEPTORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grease interceptors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Semi-Automatic Grease Draw-Off: Unit shall be on-floor type, cast iron, porcelain, or painted inside and out, with internal air relief, grease draw-off piping, and valve with flow control fitting. Draw-off piping and nozzle may be interchanged in field to make unit a right- or left-handed installation. Unit shall also have double wall trap with removable baffles and gasketed cover with low pressure chamber. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.

2.2 Manual Grease Draw-Off: Unit shall be on-floor type, partially recessed or flush-with-floor type, cast iron, porcelain, or painted inside and out, with internal air relief and flow control fitting. Unit shall have double wall trap, removable baffles, gasketed cover bearing plumbing, and drainage seal of approval. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.

2.3 Manual Grease Draw-Off, Coated Steel Type: Unit shall be high volume on floor or partially recessed, with internal air relief, double wall trap, removable baffles, gasketed non-skid cover, and flow control fitting. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.

3.0 EXECUTION: The unit shall be placed in the influent line of the waste water disposal and treatment system.



SECTION 02745 IMHOFF TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant Imhoff tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Coatings:

- 2.1.1 Epoxy-Filler Compound for concrete surfaces shall comply with Fed. Spec. MMM-A-001993.
- 2.1.2 Coal-Tar Epoxy shall comply with SSPC-PAINT 16.
- 2.1.3 Epoxy Paint shall comply with Mil. Spec. MIL-P-24441.
- 2.1.4 Red-Lead Base Paint shall comply with Fed. Spec. TT-P-86, Type I.
- 2.1.5 Aluminum Finish Paint shall comply with Fed. Spec. TT-P-38.
- 2.2 Steel Tank Repair Material for minor leaks shall be a two-component epoxy sealing compound. For badly corroded areas, a steel plate of the same composition and thickness as the original tank shall be used.
- 2.3 Pipe and Fittings for replacement shall be equivalent to the existing pipe and fittings.

3.0 EXECUTION:

3.1 Preparation: Drain the contents of the tank and dispose of the sludge and sewage.

3.2 Leak Repair:

- 3.2.1 Concrete Tanks: Repair concrete tank leaks by cleaning and chipping or sandblasting the area of the leak and applying two-component epoxy concrete sealant.
- 3.2.2 Steel Tanks: Repair steel tank leaks by cleaning, scraping, chipping, or sandblasting the area of the leak and applying epoxy steel sealant. Repair badly corroded areas of steel tanks by cutting out the corroded area and welding a section of new steel plate in place. Welding shall be in compliance with AWS D1.1.

3.3 Pipe and Fittings: Replace pipe and fittings as required.

3.4 Cleaning and Coatings:

- 3.4.1 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted.
- 3.4.2 Holes and Voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of epoxy filler. Two coats of coal-tar epoxy shall be applied to the surface after the epoxy has cured.
- 3.4.3 Submerged Ferrous Metal Surfaces such as piping and equipment that are exposed to the sewage shall be sandblasted and coated with two coats of coal-tar epoxy.
- 3.4.4 Exterior Concrete Surfaces of the tank shall be cleaned by means of brush sandblast. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint shall be applied.
- 3.4.5 Ferrous Metal Surfaces that are not submerged shall be cleaned by means of sandblasting. Coat surfaces with one coat of red-lead base paint. After the base paint has dried sufficiently, apply two coats of aluminum finish paint.

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SECTION 02766 SEWER LINE PIPE LINING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sewer line pipe lining. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Lining Material:

2.1.1 Polyethylene Pipe: Extruded, flexible industrial grade, high density (Type 3 or 4) in 40 foot lengths, complying with ASTM D 2239 and D 2447.

2.1.1.1 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into the existing sewers. Pipe dimensions shall comply with ASTM D 2447 and D 2837.

2.1.1.2 Liner Thickness and Class shall be suitable for the use intended. The tolerance on the pipe wall thickness shall be as noted in Table 2 of ASTM D 2447.

2.1.1.3 Gravity Sanitary, Gravity Storm, and Gravity Industrial Sewers shall be Schedule 40.

2.1.1.4 Gravity Thermal Discharge Sewers shall be Schedule 80.

2.1.1.5 Low Pressure Sewers shall be Schedule 40, complying with ASTM D 2239.

2.1.1.6 High Pressure Sewers shall be Schedule 80, complying with ASTM D 2239 and D 2837.

2.1.1.7 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.

2.1.1.8 Fittings shall be fabricated from polyethylene pipe. The polyethylene fittings shall have the same pressure rating as the pipe and shall comply with ASTM D 3261.

2.1.2 Cement-Mortar Lining:

2.1.2.1 Portland Cement shall comply with ASTM C 150, Type 1.

2.1.2.2 Pozzolan Cement shall comply with ASTM C 618 and shall not comprise more than 20 percent of total cement amount, by weight.

2.1.2.3 Sand shall be well graded, clean, free from organic and extraneous matter. One hundred percent shall pass the 16-mesh size screen.

2.1.2.4 Lining Thickness: Cement lining shall be not less than 1/8 inch for pipe sizes 4 to 14 inches, not less than 3/16 inch for pipe sized 16 inches and larger, and not less than 1/4 inch for steel pipe 16 inches and larger.

2.1.3 Reinforced Mortar Pipe Slip-Lining:



2.1.3.1 Gravity Sewers: Slip-lining shall be of glass fiber reinforced polyester mortar pipe, complying with ASTM D 3262.

2.1.3.2 Pressure Sewers (Force Mains): Slip-lining shall be of glass fiber reinforced polyester mortar pipe complying with ASTM D 2517.

2.1.3.3 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into existing sewers, as recommended by the manufacturer.

2.1.3.4 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.

2.1.3.5 Fittings: Fittings shall be manufactured of the same materials as is the glass fiber reinforced polyester mortar pipe.

2.1.4 Epoxy-Mortar Lining:

2.1.4.1 Epoxy Compound shall comply with ASTM D 1763.

2.1.4.2 Admixtures shall be well graded with one hundred percent passing the 16-mesh size screen. All admixtures shall improve the workability, density, and strength of the mortar.

2.1.4.3 Lining Thickness: For pipe sizes 4 to 14 inches, epoxy mortar lining thickness shall be not less than 1/8 inch. For pipe sizes 16 inches and larger, epoxy mortar lining shall be not less than 3/16 inch.

2.2 Joint:

2.2.1 Slip-Lining:

2.2.1.1 Polyethylene Pipe Butt Joints: Pipe lengths, fittings, and flanged connections to be joined by thermal butt fusion shall be of the same type, grade, and class of polyethylene compound and supplied by pipe supplier.

2.2.1.2 Flanged Joints shall consist of a polyethylene flange, thermally butt fused to the ends of the pipe. The companion flange shall be steel or cast iron and nylon-coated.

2.2.1.3 Lateral Service Connections: Sidewall connections shall be made with polyethylene pipe sections of the same material, grade, and class as the liner material and shall have the same pressure ratings. Lateral connections shall be watertight.

2.2.2 Reinforced Mortar Lining:

2.2.2.1 Bell and spigot joints shall be the inverted type.

2.2.2.2 Manhole Joints and Connections shall be oakum ring and grout as required.

3.0 EXECUTION:

3.1 Slip-Lining, Polyethylene Pipe:

3.1.1 Insertion of Liner: Liner shall be laid at a constant line and grade as the existing pipe, without undulations or damage. Where the existing pipe is not at constant grade, the liner shall follow as true a constant grade as possible.

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3.1.2 Grouting: At manholes, annular space shall be packed with oakum and expansion grout or nonshrink grout as required. At existing line, after liner has been inserted, grout wherever existing pipe has failed structurally.

3.1.3 Concrete Encasement: Crown of liner shall be encased in concrete a minimum thickness of 6 inches for the entire length of the excavated trench and out at least 6 inches each side of the bottom half of the original pipe remaining down to firm soil. Wherever existing concrete encasement has been removed, the liner shall be encased in the same manner as the original pipe.

3.1.4 Thrust Blocks: Concrete thrust blocks shall be provided as required.

3.2 Cement Mortar and Epoxy Mortar Lining:

3.2.1 Cement Mortar Mixing: One part cement to one and one-half parts of sand by volume.

3.2.2 Application of Lining: The lining shall be applied to produce a smooth, uniform thickness throughout the interior of the pipe line.

3.2.3 Curing of the Cement Mortar Lining: Immediately upon completion of the lining of a length of pipe between access openings or at the end of a day's run, the section of pipe shall be closed at each end, the access openings covered to prevent the circulation of air, and the atmosphere kept moist.

3.2.4 Reconnection of Pipes After Lining: Close and make watertight all openings in the sewer lines.

3.2.5 Pressure Test and Leaks: Hydrostatic and leakage test shall be conducted on all pipe that is cleaned and lined.

3.3 Reinforced Mortar Pipe Lining:

3.3.1 Joining of Pipe Ends: Liner sections containing bell and spigot joints shall be joined using an O-ring.

3.3.2 Grouting Work shall be accomplished following the same techniques as described in paragraph Slip-Lining, Polyethylene Pipe.

3.4 Cement Mortar Lining:

3.4.1 Epoxy Mortar Lining: Excessive mortar shall be removed from the manhole walls and bottom. Manhole bottom shall receive special care in making all transitions smooth.

3.4.2 Work at Service Connections: Plugs or caps shall be placed at the access point of the service connection to the sewer and shall be removed once the mortar has set. The completed lining shall not be damaged.

3.5 Reinforced Mortar Pipe Lining: Joining of fiberglass reinforced polyester mortar pipe shall be carried out in the trench, with the first section of liner already inserted.

3.6 Lateral Connections: Service to connections shall be provided for and continued after installation of the lining.

3.7 Testing: Upon completion of lining operation, the sewer line shall be tested for proper operation and shall be observed for a period of 24 hours. All deficiencies shall be corrected.



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3.8 Pavement Restoration: All disturbed pavement shall be restored to its original condition and shall match existing adjacent.

3.9 Inspection: Large diameter sewers shall be inspected from inside to ensure that all lateral connections and joints are in proper order. Sewers that have been cement-lined may be inspected for a smooth finish, while plugs and caps are being removed.



Section 02774 Sewage Treatment Lagoons

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment lagoons. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Block shall comply with ASTM C 129.

2.2 Concrete Grout shall comply with Fed. Spec. MMM-A-001993.

2.3 Riprap Stone shall comply with AREA-01.

2.4 Concrete Repair Material shall comply with Fed. Spec. MMM-A-001993.

2.5 Sand shall comply with ASTM C 33.

2.6 Portland Cement shall comply with ASTM C 150, Type V.

2.7 Rubble shall consist of broken concrete or broken stone.

3.0 EXECUTION:

3.1 Algae Removal shall be by mechanical or manual methods and shall include, but not be limited to, skimming, pumping through a screen, raking, or draining and cleaning the lagoon.

3.2 Slope and Dike Reconstruction shall be made to re-establish the original design configuration and grades. Place riprap, where required, so that its angle of repose is not exceeded.

3.3 Liner Reconstruction and Repair shall be made with materials compatible with the existing liner and compatible with the wastewater and sludge to be contained therein.

3.4 Repairs to Elastomeric Membrane Liners shall be made with like material and shall overlap all cuts, tears, fractures or other defects a minimum of 4 inches. Cut repair pieces square or rectangular. The method of bonding the new material to existing material shall be similar to the original joint banding method, except when the original joints have failed. In this case, the material supplier shall demonstrate that an alternate jointing system shall be satisfactory to the Contracting Officer. Replace earth or sand cover removed during repair or replacement of plastic liner to the same thickness as the original installation.

3.5 Repairs to Non-Elastomeric Membrane Liners shall be made by cutting out defective areas back to sound liner material and replacing with similar material. Joints shall be watertight.



SECTION 02830 FENCES AND GATES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fences and gates. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Ground Rods, Down Conductors, and Connectors:

2.1.1 Ground Rods: Galvanized steel rods, 3/4 inch in diameter by 10 feet in length.

2.1.2 Down Conductors: No. 8 copper wire or equivalent.

2.1.3 Connectors: Pressure type bolted or compression type.

2.2 Foundations shall be concrete with a minimum 28-day strength of 3,000 psi, and shall extend from 3 feet 6 inches below finished grade to 2 inches above finished grade. Tops of foundations shall slope away from posts. Extend gate post foundations to the underside of the bottom hinge. Foundations for line posts shall be 10 inches in diameter. Foundations for terminal and gate posts shall be the diameter of the post plus 8 inches but not less than 12 inches.

3.0 EXECUTION:

3.1 Existing Fence Connections: Wherever new fencing joins an existing fence, either at a corner or at the intersection of straight line fences, a corner post with brace post shall be set at the junction and braced. If the connection is made elsewhere than the corner of the fencing, the last span of the existing fence shall contain a brace span.

3.2 Security Fence: Wherever existing fencing fabric is embedded in concrete or earth, or attached to an earth-embedded galvanized steel sheet, repairs shall be made as follows:

3.2.1 Earth Embedment: Install new fabric or galvanized steel sheet to depth of existing. Attach steel sheet securely to adjacent existing sheeting and new and existing fencing fabric. Thoroughly backfill and compact soil in repair area.

3.2.2 Concrete Embedment: Install fence fabric to the depth of existing fabric. Place concrete to match existing configuration. Clean all exposed fencing of concrete that is a result of new construction.

3.3 Gate Installation: Install, plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Install and adjust hardware for smooth operation and lubricate where necessary.

3.4 Grounding: Ground on each side of every gate where crossed by high-tension-line crossings, at 1,000 to 1,500 foot intervals along fence in isolated areas, and at 500 to 750 foot intervals when in close proximity (100 feet or less) to public roads, highways, and buildings. Down conductors shall run full height of fence wherever wood posts are used and shall be securely fastened to each strand of wire to provide electrical continuity.

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3.5 Field Painting: At the completion of repair work, touch up all surfaces damaged by construction operations. Galvanized surfaces shall be painted with zinc-oxide paint. Wood, steel, vinyl coated, aluminized, and other fencing materials shall be touched up following the manufacturer's recommendations or to match existing finish.

3.6 Final Grading: The final ground surface shall be graded to remove irregularities and maintain the clearance between the bottom of the fence and the ground surface.

3.7 Seeding and Sodding: Seed or sod all lawn areas disturbed by repair and maintenance operations with a plant variety of the same species as that in adjacent areas. Areas where grass does not take hold shall be reseeded or resodded as directed by the Contracting Officer.



Section 02831 Steel Chain-Link Fencing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel chain-link fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Galvanized Fabric shall comply with Fed. Spec. RR-F-191/1, Type I, of 9 gauge wire and 2-inch mesh.

2.2 Framework: Posts, top rails, and braces shall be galvanized steel pipe in compliance with Fed. Spec. RR-F-191/3, Class 1.

2.3 Gates shall comply with Fed. Spec. RR-F-191/2 and shall be of the same type, size, and shape as the existing. Provide a keeper to automatically engage and hold the gate leaf open until manually released, a center plunger rod, a center stop, vertical lift framework, and sliding track.

2.4 Electric Operator for gates shall include a totally enclosed motor, starter, gear reduction, clutch, limit switch, and housing. Operator shall be controlled by an electric lock. Slide gate operators shall be equipped with magnetic brake, manual disconnect, and chain drive. Swing gate operators shall be equipped with a crank arm.

2.5 Accessories:

2.5.1 Barbed Wire shall comply with Fed. Spec. RR-F-191/4 and shall be two strands of 12-1/2 gauge galvanized steel wire, twisted, with four point barbs spaced five inches apart.

2.5.2 Post Caps: Pressed steel or malleable iron, galvanized, and of the configuration required.

2.5.3 Extension Arms for barbed wire shall extend outward at a 45 degree angle and shall have provision for attaching three strands of barbed wire with the top strand approximately one foot above the fence fabric.

2.5.4 Stretcher Bars: Minimum 3/16-inch by 3/4-inch steel bars, galvanized in compliance with ASTM A 123.

2.5.5 Stretcher Bar Bands: Heavy pressed steel bands, galvanized in compliance with ASTM A 123.

2.5.6 Tension Wire: Spring coil or crimped wire of minimum seven gauge galvanized steel with minimum tensile strength of 80,000 pounds per square inch and coating as specified for the fabric.

2.5.7 Fasteners: Steel wire with an ASTM A 641, Class 1 galvanized coating.

2.5.8 Slat Inserts: California Redwood treated with a stain preservative to maintain appearance.

2.5.9 Boulevard Clamps: Stamped 13 gauge mild steel, galvanized, in compliance with ASTM A 641, Class 1. Clamps for vinyl coated fence shall have the vinyl coating applied over the zinc coating.

3.0 EXECUTION:

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3.1 Posts: Set plumb, in straight alignment with other posts, evenly spaced and rigidly set. Set posts to a depth of 3 inches above the bottom of the concrete foundation.

3.2 Rails:

3.2.1 Top Rail: Install continuous through post caps, securely fastening to end, corner, pull, and gate posts with rail end.

3.2.2 Intermediate and bottom rails: Attach to line posts with boulevard clamps and to terminal posts with rail ends.

3.3 Truss Bracing: Securely fasten to end, corner, pull, and gate posts 12 inches below cap and extend to the adjacent line post. Braces shall be trussed from the line post to the bottom of the terminal post with round rods and turnbuckles.

3.4 Fabric:

3.4.1 Repair (Cutting and Patching) of Fabric: Cut out the damaged fabric, position new fabric to line up with existing mesh, and securely fasten to existing fabric.

3.4.2 Replacement of Fabric: Stretch to proper tension and securely fasten to terminal posts using stretcher bars.

3.4.3 Restretching Existing Fabric: Stretch existing fabric indicated to be restretched to proper tension and refasten to posts and rails.

3.5 Barbed Wire: Stretch and secure to extension arms with heavy wire pins.

3.6 Gate Hinges: Install to prevent twisting or turning under action of the gate and to swing through 180 degrees from closed to open position.



SECTION 02832 STEEL ROD AND BAR FENCING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel rod and bar fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets shall be of height and style required to match existing, solid mild steel bar, galvanized in compliance with ASTM A 123.

2.2 Framework: Posts and rails shall be of length and style to match existing, solid mild steel, galvanized in compliance with ASTM A 123.

2.3 Gates:

2.3.1 Frame: Galvanized steel, all welded construction.

2.3.2 Truss Rods: Galvanized steel as required for stability, minimum 3/16 inch in diameter.

2.3.3 Hardware: Gate latches, hinges, gate track, trolley, rollers, plunger rod, and locks as required.

2.4 Accessories:

2.4.1 Brackets: Malleable iron or pressed steel of the sizes and configurations required to adequately support attached members, minimum 3/16 inch thick.

2.4.2 Trim: Flat caps for all posts and pickets where required. Caps shall be galvanized cast iron or zinc die castings of thickness standard to the manufacturer.

2.4.3 Sleeves: Where required, sleeves shall be minimum 16-gauge steel tubing of the required configuration to receive post. Sleeves shall be galvanized in compliance with ASTM A 123.

3.0 EXECUTION:

3.1 Pickets: Fasten pickets to rails with clip angles and bolts and nuts.

3.2 Posts: Set posts in sleeves or footings as required to match existing conditions.

3.3 Brackets: Brackets for wall mounting and change of grade shall be securely fastened to wall and/or posts with appropriate fasteners.

3.4 Alignment: Finished fencing shall be in proper alignment with all posts plumb.

3.5 Welding: Comply with AWS D1.1.

3.6 Repair: Items shall be straightened, welded, sufficiently bolted, or otherwise strengthened as required.

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SECTION 02833 WROUGHT IRON ROD AND BAR FENCING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wrought iron rod and bar fencing including ornamental malleable iron fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets shall be 3/8-inch square wrought iron rods of the required length and configuration.

2.2 Gates: Hardware shall be compatible with existing hardware in appearance and function.

2.3 Accessories:

2.3.1 Brackets: Brackets for fastening fencing to walls, floor, posts, and other attachments shall be wrought iron.

2.3.2 Trim: Provide iron trim items as required.

2.3.3 Bolts and Nuts shall be ASTM A 307 and galvanized in compliance with ASTM A 153.

3.0 EXECUTION:

3.1 Pickets shall be welded to rails. Welding shall comply with AWS standards and shall seal the joint against moisture.

3.2 Rails shall be securely fastened to posts with angle brackets.

3.3 Posts shall be set in sleeves or footings to match existing conditions. Posts set in sleeves shall have the annular space between the sleeve and post filled with lead or sulfur.

3.4 Brackets for wall mounting and change of grade shall be securely fastened to wall and/or posts with appropriate fasteners.

3.5 Gates:

3.5.1 Frame: Iron rod and bar rails and pickets shall be welded with full welds into sections in a pattern matching existing fencing. Rail-and-picket sections shall be fastened to posts with angle brackets, bolts, and nuts.

3.5.2 Bracing: Iron rod or bar braces shall be welded in place when required to strengthen the gate.



SECTION 02834 PRE-CAST CONCRETE AND MASONRY FENCING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of precast concrete and masonry fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fence Materials:

2.1.1 Pre-Cast Concrete: Match existing fencing units in all dimensions, patterns, colors, and textures. Units shall comply with ASTM C 145 Grade N, Type 1 for solid units and ASTM C 90 Grade N, Type 1 for hollow units, and ACI 318 as applicable.

2.1.2 Brick: Exposed brick masonry shall comply with ASTM C 216, Grade SW. Brick for below grade shall comply with ASTM C 62, Grade SW. Brick shall be selected for appearance to match existing brick in dimension, color, and texture.

2.1.3 Mortar:

2.1.3.1 Mortar shall comply with ASTM C 270, Type S and shall be 1 part Portland cement (ASTM C 150), 1/2 part lime (ASTM C 207), and 4-1/2 parts sand (ASTM C 144). Sand for joints 1/4 inch or less shall pass a No. 16 sieve. Sand containing any substance that will stain the masonry shall not be used. Waterproofing admixtures shall be approved by the Contracting Officer.

2.1.3.2 Colored Mortar shall be a factory-formulated mixture of masonry cement complying with ASTM C 91 and mortar color.

2.1.4 Masonry Grout: Coarse grout for masonry lintels and for filling cells in masonry units shall consist of 1 part Portland cement, 1/10 part lime, and 1-1/2 parts sand. Fine grout for bedding and grouting steel and for all other applications shall consist of 1 part Portland cement, 1/10 part lime, and 2-1/2 parts sand. Use waterproofing admixture in all grout used in exterior walls.

2.2 Posts:

2.2.1 Line Posts: Line posts shall be of the same materials and configuration as existing posts with reinforcing as required.

2.2.2 Terminal and Corner Posts: Match existing terminal and corner posts in configuration and adequately reinforce.

2.2.3 Gate Posts: Gate posts shall have all attachments for gates firmly embedded and shall be of sufficient strength to withstand stresses applied by the gate.

2.3 Rails: Rails shall be of the same materials and configuration as existing rails with all accessories for firmly attaching to posts.



2.4 Gates:

2.4.1 Frame: Constructed of 2 x 4 wood members with attached pickets. Configuration of gate shall match that of existing gates.

2.4.2 Gate Bracing shall consist of a single 2 x 4 running diagonally across the gate to opposite corners of the frame. High end of brace shall be at hinge edge of gate.

2.4.3 Hardware: Hinges, latches, and other hardware shall be hot-dipped galvanized steel in compliance with ASTM A 153 and of configurations to match existing hardware.

2.4.4 Padlock: Padlocks shall comply with ASTM F 883.

2.5 Accessories:

2.5.1 Special Shapes: Special shapes, including copings and post caps, shall be as required to match existing units to be replaced.

2.5.2 Reinforcement: Masonry reinforcement, anchors, and ties shall comply with the following requirements:

2.5.2.1 Reinforcement Bars shall comply with ASTM A 615, Grade 40.

2.5.2.2 Joint Reinforcement shall be prefabricated from zinc-coated cold drawn steel wire in compliance with ASTM A 641. Provide prefabricated pieces for corners and intersections of walls. Reinforcement shall be truss type, approximately two inches narrower than the nominal thickness of wall.

2.5.2.3 Wire-Mesh Ties shall be 16-gauge or larger zinc-coated steel wire woven into 1/2-inch mesh and cut in strips one inch narrower than the width of walls in which they are used. Zinc-coating shall comply with ASTM A 641.

2.5.2.4 Wire Brick Ties shall be fabricated from 3/16-inch diameter zinc-coated steel wire complying with ASTM A 641.

2.5.3 Attached Items: Light fixtures and miscellaneous items attached to the fencing shall be provided with appropriate means for securely fastening to fence components.

2.5.4 Bolts and Nuts shall be ASTM A 307 and galvanized in compliance with ASTM A 153.

2.6 Foundations:

2.6.1 Material: Where foundation work is required for maintenance and repair, the new foundation shall match the existing foundation in materials and design.

2.6.2 Depth: Foundations shall extend below frost line or to the depth of existing foundations, whichever is greater.

3.0 EXECUTION:

3.1 General:

3.1.1 All Scaffolding and Falsework shall be ample strength and well secured. Masonry work exceeding 10 feet in height shall be properly braced and supported until masonry is self-supporting.

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3.1.2 Where Fresh Masonry Joins Partially or Totally Set Masonry, clean the exposed surface of the set masonry to obtain the best possible bond with the new work. Remove all loose masonry units and mortar.

3.2 Mixing Mortar and Grout:

3.2.1 Mix in a Mechanical Batch Mixer for a minimum of 5 minutes after all materials have been added.

3.2.2 Mix Grout in compliance with ASTM C 476. Grout shall have a consistency at time of placement to yield a slump of 10 to 11 inches as determined by ASTM C 143.

3.3 Reinforcement:

3.3.1 Install Horizontal Continuous Joint Reinforcement in all unit masonry fences. Reinforcement shall start not more than 8 inches above the masonry supporting surface and end within the top full mortar joint, or to match existing conditions and shall be spaced at maximum 16-inch centers vertically.

3.3.2 Joint Reinforcement shall be placed approximately 1/2 inch from masonry faces.

3.3.3 At intersections, bond each course with wire mesh ties or prefabricated joint reinforcement spaced not to exceed 16 inches vertically.

3.3.4 Install Vertical Reinforcement bars of the size indicated on the drawings in the hollow cores of masonry units as required. Fill all cells containing reinforcement for the full height of the reinforcement with grout.

3.4 Precast Concrete:

3.4.1 Bond shall be laid to match existing pattern. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Webs shall also be bedded in all courses of posts, in starting course on footings and solid foundation walls and around cells that are to be reinforced or filled with grout.

3.4.2 All Exposed Mortar Joints shall be tooled with a round jointer to produce smooth, dense, concave joints, except as otherwise required to match existing mortar joints.

3.5 Brick:

3.5.1 Bond shall be laid out to maintain joints to uniform thickness throughout.

3.5.2 Brick shall be laid with completely filled mortar joints to match existing. Mortar beds shall be spread smooth. The ends of brick shall be buttered with sufficient mortar to fill the end joint.

3.5.3 All Exposed Mortar Joints shall be tooled with a round jointer to produce smooth, dense, concave joints.

3.6 Pointing and Cleaning: Upon completion, all new joints shall be carefully pointed, filling all holes. Cut out defective joints and repoint them with mortar. Keep all exposed masonry clean and free of mortar as the work progresses. Clean masonry surfaces using fiber brushes and trisodium phosphate solution; acid shall not be used for any masonry cleaning. Rinse surfaces with clean water immediately after cleaning.



Section 02835 Permanent Wood Fencing

1.0 DESCRIPTION OF WORK: The specification covers the furnishing and installation of materials for repair and maintenance of permanent wood fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets:

2.1.1 Size: Wood for pickets shall match the existing fencing in material, configuration, dimensions, texture, and finishes.

2.1.2 Attachment: Hot-dipped galvanized nails complying with Fed. Spec. FF-N-105 shall be used to fasten pickets to rails.

2.2 Framework:

2.2.1 Line Posts: 4 x 4 of required length to match existing post height and extend into the ground as required to assure rigid installation.

2.2.2 Terminal and Corner Posts: 4 x 4 of required length.

2.2.3 Gate Posts: 4 x 6 and of the length required for firm embedment to resist gate action.

2.2.4 Top Rail: 2 x 4 of length required to span between posts.

2.2.5 Where Bracing is Required, it shall match top and bottom rails in dimension and finish.

2.2.6 Metal Posts and Rails: Solid mild steel galvanized in compliance with ASTM A 123 of the length and style required to match existing.

2.3 Gates:

2.3.1 Frame: 2 x 4 members with attached pickets. Configuration of gate shall match that of existing gates.

2.3.2 Bracing: Single 2 x 4 running diagonally across the gate to opposite corners of the frame.

2.3.3 Hardware: Hinges, latches, and other hardware shall be hot-dipped galvanized and of configurations to match existing hardware. Bolts and nuts shall comply with ASTM A 307 and galvanized in compliance with ASTM A 153.

2.4 Finish: All wood fence members shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with AWPA C1 or AWPA C4. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment. Paint to match existing after treatment and installation.

3.0 EXECUTION:

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3.1 Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground. Posts of fencing that are higher than four feet and exposed to strong winds and posts at all gates shall be of heavy construction and shall be embedded in concrete.

3.2 Rails: Install at the height and in the manner required to match existing fencing, and secure to post with fasteners similar to existing.

3.3 Pickets: Space, attach, and position to match existing pattern and attachment methods.

3.4 Accessories: Install to match existing conditions.



Section 02836 Snow And Other Temporary Fencing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of snow and other temporary fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets:

2.1.1 Size: Wood pickets shall be 3/8 inch thick, 1-1/2 inches wide, and 48 inches high.

2.1.2 Coating: Red oil paint or stain.

2.1.3 Spacing: Approximately two inches apart.

2.1.4 Attachment: Bind together with three double strands of wire.

2.2 Framework:

2.2.1 Materials: Wire shall be 13 gauge galvanized steel, complying with ASTM A 641.

2.2.2 Types: The framework shall consist of three parallel double strands of wire twisted between pickets to hold them securely in place.

2.2.3 Wire Connectors: Wire for attaching fabric to metal posts shall be nine gauge.

2.2.4 Staples and Nails shall comply with Fed. Spec. FF-N-105. Staples and nails shall be zinc-coated and of sufficient length for purpose required.

2.3 Gates:

2.3.1 Frame: Frames shall consist of two parallel horizontal wooden members with pickets attached at two-inch spacing.

2.3.2 Bracing: Two wooden members placed diagonally on the gate between the frame boards.

2.3.3 Hardware shall include two strap hinges, latching device, and stop bar, all of zinc-coated steel, in compliance with ASTM A 153.

2.4 Supports:

2.4.1 Steel: Line posts and uprights shall be drive type, T sections, and provided with suitable anchor plate. The sections shall be hot-rolled steel complying with ASTM A 702, galvanized in compliance with ASTM A 123. The T sections shall have the following minimum sizes:

Post Length (Feet) Post Weight (Pounds)

5 7.32

5 1/2 7.99

6 8.65

6 1/2 9.32

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7 9.98
7 1/2 10.64
8 11.31
9 12.64
10 13.97

2.4.2 Wood: Posts shall be cut from cedar, Douglas fir, pine, or other approved species of timber. Posts shall be peeled, treated, dressed, and cured. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with AWWA C1 or AWWA C4. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment.

2.4.3 Braces: Steel braces shall have same configuration as line posts and uprights without the anchor plate. Wood braces shall be treated No. 2 or better grade, Douglas fir or southern yellow pine. Braces shall meet all of the requirements for wood posts.

2.4.4 Location: Posts shall be evenly spaced to adequately support the fence framework.

3.0 EXECUTION:

3.1 Wood Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground.

3.2 Steel Posts: Hold in a vertical position and drive to the required depths by an approved post driver. Post tops shall not be damaged during driving.

3.3 Corner, Brace, Or End Panels: Construct corner, brace, or end panels at the beginning and terminal ends, at gate openings, at all intersections, and at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence (except when junction is at a corner already braced), and on both sides of cattle guards.

3.4 Pull Posts shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equidistant in the fence at intervals of 640 feet or less.

3.5 Framework Installation: Stretch to proper tension and securely fasten to posts. Top and bottom wires of fabric shall be tied or stapled to each post. Tie or staple every other wire to alternating posts. Every wire shall be tied or stapled to corner, pull, end, and gate posts. Wire for tied fabric shall be nine gauge.

3.6 Picket Replacement: Where required, new pickets shall be securely fastened into the existing wire framework using 13 gauge galvanized wire.

3.7 Restretching Existing Fabric: Fabric designated to be restretched shall be restretched to proper tension and refastened to posts. Excess fabric extending beyond the post shall be removed.



Section 02837 Farm-Type Wire Fencing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and replacement of farm-type wire fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fabric shall be galvanized steel wire complying with ASTM A 116.

2.2 Framework:

2.2.1 Steel:

2.2.1.1 Posts shall comply with ASTM A 702, T-section, zinc-coated.

2.2.1.2 Stays shall be 9-1/2 gauge twisted wire, galvanized in compliance with ASTM A 641, Class 3.

2.2.2 Wood: Posts shall be cut from cedar, Douglas fir, pine, or other approved species of timber. Posts shall be peeled, treated, dressed, and cured and shall contain no unsound knots. All posts shall match existing post dimensions. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with CEAGS 02831B

2.2.3 Preservative. Wood cut or sawed after treatment shall have the cut surfaces well-coated with the preservative used in the treatment. All wood shall be pressure treated in accordance with AWPAC1 or AWPAC\$, as applicable.

2.3 Braces: Steel braces shall have the same configuration as line posts and uprights without the anchor plate. Braces shall meet all of the requirements for wood posts.

2.4 Connectors:

2.4.1 Wire for Attaching Fabric to Posts shall be 12-1/2 gauge or coarser, galvanized in compliance with ASTM A 641, Class 3.

2.4.2 Staples and Nails shall comply with Fed. Spec. FF-N-105. Staples and nails shall be zinc-coated and of sufficient length for purpose required.

2.5 Gates:

2.5.1 Tubular Steel:

2.5.1.1 Frame shall be a minimum of 1-3/8 inch outside diameter tubular steel, braced with a sturdy center bar and diagonal adjustable brace wire to prevent sagging. Gates shall be fitted with hinges. All material shall be hot-dipped zinc-coated.

2.5.1.2 Fabric for Gates shall be as specified for the fence and shall be securely tied to the framework at top, bottom, and sides with 9-gauge wire.

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2.5.2 Angle Iron:

2.5.2.1 Frame shall be fabricated of angle iron with cross ties and stays of light angle iron. Frame shall be zinc-coated in compliance with ASTM A 120 or A 153.

2.5.2.2 Fabric for Gates shall be as specified for the fence and shall be securely tied to the framework at top, bottom, and sides with 9-gauge wire.

2.5.3 Wood: Provide a 3/8-inch minimum diameter galvanized steel truss rod and turnbuckle.

2.6 Barbed Wire:

2.6.1 Barbed Wire shall comply with ASTM A 121 and shall be made from 2 strands of 12-1/2 gauge galvanized steel wire, twisted, with four-point barbs spaced five inches apart. Wire shall have Class 2 zinc coating.

2.7 Hardware:

2.7.1 Gate Hardware shall include the following:

2.7.1.1 Bottom Hinge shall be designed to carry the weight of the gate.

2.7.1.2 The Upper Hinge shall be adjustable.

2.7.1.3 Lock with Chain shall be 1-3/4 inch size complying with ASTM F 883.

2.7.1.4 Keeper shall automatically engage and hold the gate leaf open until manually released.

2.7.1.5 Center Plunger Rod.

2.7.1.6 Center Stop.

2.7.1.7 Vertical Lift.

2.7.1.8 Sliding Track.

2.7.2 Lightning Arresters, Insulators and Insulator Clamps, Fasteners, Signs, and Other Accessories shall be provided and installed as required.

3.0 EXECUTION:

3.1 Wood Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground. Refasten all braces, gates, hardware, fabric, and other accessories.

3.2 Steel Posts: Steel posts shall be held in a vertical position and driven to the required depths by an approved post driver. Tops of posts shall not be damaged by driving operation.

3.3 Corner, Brace, or End Panels: Corner, brace, or end panels shall be constructed at the beginning and terminal ends, at gate openings, at all intersections, at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence, (except when junction is at a corner already braced), and on both sides of cattle guards.



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3.4 Pull Posts shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equidistant in the fence at intervals of 640 feet or less.

3.5 Wire Installation: Barbed and/or woven wire fabric shall be stretched to proper tension and securely fastened to posts. Top and bottom wires of fabric shall be tied or stapled to each post. Tie or staple every other wire to alternating posts. Every wire shall be tied to corner, pull, end, and gate posts. Wire for tying woven wire fabric and barbed wire shall be 9-gauge.

3.6 Restretching Existing Fabric: Fabric indicated to be restretched shall be restretched to proper tension and refastened to posts. Excess fabric extending beyond the post shall be removed.

3.7 Alignment: Finished fencing shall be plumb and in proper alignment with posts, and all wire work shall be taut.

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SECTION 02840 ELECTRICAL TRAFFIC CONTROL SIGNALS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical traffic control signals. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Replacement equipment items shall be regularly manufactured products.

2.2 Concrete Poles: Cement ASTM C 150; aggregate ASTM C 33; minimum compressive strength 6,000 psi when tested in compliance with AASHTO T22. Tensioning steel shall comply with ASTM A 603. Strands shall not be tensioned above 70 percent of the rated ultimate strength. Epoxy compound for sealing hollow cores shall comply with ASTM D 1763.

2.3 Galvanized Conduit Nipples: UL 514B.

2.4 Ground Wire: Cast-in-concrete pole, No. 6 stranded bare wire, ASTM A 603.

2.5 Wood Poles: ANSI 05.1, waterborne preservative-treated in compliance with AWPAC3, Retention Zone 1.

2.6 Structural Steel: ASTM A 36.

2.7 Steel Pipe: ASTM A 53.

2.8 Steel Bars: ASTM A 576.

2.9 Wire Strand: ASTM A 475.

2.10 Zinc Coatings: Members, ASTM A 123; fasteners, ASTM A 153.

2.11 Mast Arms for Supporting Traffic Signals: ASTM A 36; aluminum alloy 3003, or alloy alcad 3004 complying with ASTM B 209.

2.12 Concrete for Pull Boxes: ASTM C 94, 3,000 psi.

2.13 Cast-Iron Covers: ASTM A 48.

2.14 Signal Lens: Manufactured in compliance with Article 5 and 6, ITE Technical Report Number 1.

2.15 Loop Wire for Vehicle Detectors: No. 14 AWG or No. 12 AWG, stranded copper wire, type TTHN, THWN, or THW, ASTM B3.

2.16 Grout: One part cement complying with ASTM C 150 and two parts sand complying with ASTM C 33.

2.17 Conduit: Polyvinyl chloride, UL 651, Schedule 40 or galvanized rigid metal, ASTM B3.



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2.18 Ground Wire: Soft drawn copper, bare, stranded, ANSI C7.1.

2.19 Electrical Work: NFPA No. 70.

3.0 EXECUTION:

3.1 Scheduling and Coordination: The Contractor shall ensure that required notices have been given and that power interruptions have been scheduled and approved.

3.2 Traffic: Provide temporary traffic signs at and around work area. Signs and locations shall be as approved by the Contracting Officer.

3.3 Vehicle Detector Assemblies, Loop Type: Saw out existing loops to be replaced to their full depth. Install and seal loop wire. Splice and solder loop wire and lead-in cable and wrap a minimum of two wraps with silicone tape and heavy-duty electrical tape. Install sealant in compliance with the manufacturer's recommendations. Excavate and remove existing lead-in cable to be replaced, and install new lead-in cable in place and connect to cabinet ground.



Section 02850 Traffic Signs

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of traffic signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Sign Foundations:

2.1.1 Replacement Foundation Footing Concrete shall be a mixture of cement complying with ASTM C 150 and aggregate complying with ASTM C 33. Compressive strength shall be 2,800 psi at 28 days.

2.1.2 Sulfur Mortar shall comply with ASTM C 287.

2.1.3 Reinforcing Steel shall comply with ASTM A 615.

2.2 Sign Supports shall be of the "break-away" type. Supports shall be strong enough to resist applicable wind forces without damage, but shall be designed to experience a brittle rupture type failure or a "quick separation" type joint.

2.2.1 Sign Support, Aluminum:

2.2.1.1 Replacement Castings shall be Alloy A356.0-T6 in compliance with ASTM B 108.

2.2.1.2 Replacement Structural Members shall comply with ASTM B 308.

2.2.1.3 Replacement Bars, Rods, Shapes, and Tubes shall comply with ASTM B 221, alloy 6061-T6.

2.2.1.4 Replacement Bolts, Nuts, and Screws shall match items being replaced and shall be alloy 2024-T4 with anodic coating complying with ASTM B 580, or 6061-T6 in compliance with ASTM B 211. Bolt heads shall be hexagon. Bolt threads shall be Class 2, 2A, or 2B in compliance with ANSI B18.2.1. Nuts shall be hexagon shaped in compliance with ANSI B18.2.2.

2.2.1.5 Replacement washers shall be furnished from sheet metal complying with ASTM B 209, alloy alclad 2024-T3 or T4.

2.2.2 Sign Support, Steel:

2.2.2.1 Replacement Structural Members shall comply with ASTM A 36.

2.2.2.2 Replacement Bars shall comply with ASTM A 108.

2.2.2.3 Replacement Pipe shall comply with ASTM A 53 standard weight.

2.2.2.4 Replacement Fasteners shall comply with ASTM A 307 and ASTM A 325.

2.2.2.5 Replacement Anchor Bolts for anchoring base plates to concrete bases and nuts and washers shall be galvanized in compliance with ASTM A 153.



2.2.3 Sign Support, Wood:

2.2.3.1 Replacement Wood Sign Post shall be of the species listed in AASHTO M168, dressed four sides and having a pyramidal top cut before being treated.

2.2.3.2 Replacement Sign Post shall be pressure treated with creosote or creosote-tar solution complying with AWPB LP-55.

2.3 Sign Face:

2.3.1 Replacement Plywood Sign Face shall be grade HDOAB G-1 EXTERIOR, in compliance with DOC PS 1. Material shall be cut to size in compliance with ANSI D6.1E.

2.3.2 Replacement Galvanizing Steel Sign Face shall comply with USDOT FHA MUTCD.

2.4 Reflective Sheeting shall be enclosed lens unless otherwise directed by the Contracting Officer.

2.4.1 Enclosed Lens Reflective Sheeting shall comply with Fed. Spec. L-S-300.

2.4.2 Reflective Sheeting shall comply with FP-79 minimum reflective intensity. Measurements shall comply with Fed. Spec. L-S-300.

2.4.3 Color shall be matched visually and within the limits shown on the Color Tolerance Charts issued by the Federal Highway Administration. The diffuse day color of the reflective sheeting shall be determined in compliance with ASTM E 97.

2.4.4 Film:

2.4.4.1 General: Reflective sheeting shall be sufficiently flexible to be easily cut to shape and permit application over, and conformance to, moderate shallow embossing characteristic of certain sign borders and symbols.

2.4.4.2 Surface: Sheeting surface shall be smooth and flat, shall facilitate cleaning and wet performance, and shall exhibit 85 degrees glossmeter rating of not less than 40, as specified in ASTM D 523. The sheeting surface shall withstand cleaning with gasoline, VM&P Naphtha, mineral spirits, turpentine, methanol, and xylol.

2.5 Demountable Sign Face Materials:

2.5.1 Acrylic Plastic Reflectors: Replacement demountable sign letters, digits, arrows, borders, and alphabet accessories shall be reflectorized and shall consist of acrylic plastic reflectors supported by embossed aluminum frames. They shall comply with the Standard Alphabet for Highway Signs, of the Federal Highway Administration, Series E.

2.5.2 Design and Fabrication: The letters shall be modified as necessary to accommodate the required reflectors. All items except border strips shall be fabricated from 0.040-inch minimum sheet aluminum. Border strips shall be of 0.032-inch minimum sheet aluminum. Mounting holes shall be provided within the frames to permit the use of screws, rivets or other acceptable fasteners. The size and spacing of the reflector holes shall provide maximum night legibility and visibility of the finished cutout figure.

2.5.3 General Requirements: The reflectors shall be of acrylic plastic meeting the requirements of Fed. Spec. L-P-380, Type I, Class 3. The reflectors shall be yellow or colorless. The lens shall consist of a

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smooth front surface, free from projections or indentations other than for identification, and a rear surface bearing a prismatic configuration that will effect total internal reflection of light.

2.5.4 Reflective Sheeting:

2.5.4.1 Demountable Sign Letters, Digits, Arrows, Borders, and Alphabet Accessories, when so specified, shall be reflectorized with reflective sheeting supported by flat aluminum backing and shall comply with the Standard Alphabet Highway Signs of the Federal Highway Administration.

2.5.4.2 Design and Fabrication: Letter design shall be Series E, modified for legibility. All items except border strips shall be fabricated from 0.040-inch sheet aluminum, 6061-T6 alloy, with mounting holes to permit use of screws, rivets, or other acceptable fasteners.

2.6 Highway Delineators, Enclosed Lens Type: Replacement reflectors shall be of acrylic plastic and a minimum of 3 inches in diameter. They shall be mounted in a heavy-duty housing with a back plate. The reflector shall consist of a clear and transparent plastic lens, which shall be colorless, and a plastic back of the same material, fused to the lens under heat and pressure around the entire perimeter to form a homogeneous unit, permanently sealed against dust, water, and water vapor. The acrylic plastic shall comply with Fed. Spec. L-P-380, Type I, Class 3.

2.7 Highway Delineators, High Intensity Type:

2.7.1 Replacement Reflectorized Delineators shall consist of a reflective sheeting compound of glass spheres, embedded in a weatherproof, synthetic, noncellulose material. The overall size of the plastic reflectors shall be 4 inches by 5 inches, with a reflective area of at least 17.5 square inches.

2.7.2 Delineators shall be silver-white when viewed with reflected light.

2.8 Highway Delineators Including Posts and Attachments:

2.8.1 Reflective Sheeting: Replacement reflective sheeting for delineators shall match delineators being replaced.

2.8.2 Delineator Posts and Accessories shall be of steel or aluminum. They shall have the necessary holes for attachment of the delineator housing. The assembly shall be furnished with the necessary bolts, nuts, and washers for attaching to the posts.

2.8.3 Insulating Materials: Neoprene, for separation of aluminum and steel parts, shall contain at least 60 percent, by volume, of pure neoprene. Other material may be used, subject to the approval of the Contracting Officer as to pliability and ability to withstand wear caused by stretching or distortion.

2.8.4 Reflector Units for guardrail installation shall match existing reflector being replaced in size and color.

2.8.5 Highway Delineators shall be supplemented with directional guidance signs as directed by the Contracting Officer. Signs shall be the chevron alignment type and shall comply with ANSI D6.1E, Type W 1-8.

2.9 Painting Panels for Nonreflectorized Background:

2.9.1 Replacement Metal Panels for sign categories not required to be reflectorized shall have a nonreflectorized background composed of one spray coat of primer and two finish coats of baked enamel.



2.9.2 Finish Coats shall be baked alkyd resin enamels meeting Fed. Spec. TT-E-529, Class B, of a composition that affects the finished background surface. When thoroughly dry, the colors shall match those described in the current Highway Blue Color Tolerance Chart, PR Color No. 3, or in Highway Green Color Tolerance Chart, PR Color No. 4, of the Federal Highway Administration.

2.9.3 Wood Signs shall have two coats of oil paint complying with Fed. Spec. TT-P-52. Message paint shall be a single coat of oil paint. All colors shall comply with ANSI D6.1E.

2.10 Sign Wash Detergent shall comply with ASTM D 3399.

3.0 EXECUTION:

3.1 Footings for Signs, Posts, and Supports:

3.1.1 Backfill Material shall be at or near optimum moisture and neither dry nor saturated. It shall be tamped thoroughly in place.

3.1.2 Concrete Footings may be cast in place or precast. Hand mixing of concrete will be permitted where the quantity does not exceed one-half cubic yard.

3.2 Erection of Signs and Sign Supports: Sign posts shall be erected vertically. Posts erected in sleeves shall be anchored with sulphur mortar. Mortar shall comply with ASTM C 287. Sign faces shall be positioned to be generally perpendicular to the line-of-sight for the observer. Reflectorized signs shall be inspected at night. If specular reflection is apparent on any sign, its position shall be adjusted by the Contractor to eliminate the condition.

3.3 Delineators and Hazard Markers: Delineator posts shall be driven to a depth of 30 inches.

3.4 Removal of Existing Signs and Posts:

3.4.1 Damaged, Obsolete, or Change of Purpose Signs and Posts shall be removed and delivered to a storage area designated by the Contracting Officer. Post hole shall be backfilled, tamped, and made level with the adjacent surface. Disturbed paving, sidewalks, and grassed areas shall be replaced with matching material of same quality and quantity as existing.

3.4.2 Signs and Posts to be Replaced shall be removed and replaced by new signs and posts in identical locations. Backfill around post shall be thoroughly compacted to hold posts securely in a vertical position.



SECTION 02860 PLAYING FIELDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of playing fields. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fills required to bring the subgrade of playing surfaces up to required elevation shall be placed in horizontal layers of not more than 8 inches in loose thickness. The top layer of all fills and excavated areas under the playing surfaces shall be compacted to 95 percent CE 55 maximum density. Each lower layer shall be compacted to at least 90 percent of MIL-STD-621, Method 100, CE 55 maximum density.

2.2 Sand-Clay Playing Surfaces shall consist of a stone foundation course, a clay foundation course, a wearing course and, where equipped, a drainage filter course, constructed on the prepared subgrade.

2.2.1 Stone Foundation Course: A layer at least 3 inches thick of 3/4- to 1-1/2 inch crushed stone shall be spread over the subgrade or over the drainage filter course constructed thereon and shall be given preliminary compaction by rolling, followed by a filler consisting of 1/4- to 1/2-inch crushed stone to fill voids in the underlying stone. The stone foundation course shall be compacted to a minimum of 90 percent of CE 55 maximum density.

2.2.2 Clay Foundation Course: Selected inorganic fat clay (CH) shall be evenly spread on the stone foundation course to produce a compacted layer not less than 3 inches thick. The clay layer shall be compacted to a minimum of 90 percent of CE 55 maximum density.

2.2.3 Wearing Course: The approved inorganic clay-silt mixture of approximately 50 percent each of clay and silt shall be screened through a 1/4-inch mesh screen. The wearing course shall be mixed in proportions of 1 part sand to 2 parts clay-silt by volume. The wearing course shall be compacted to at least 90 percent of CE 55 maximum density and shall range from 1 to 1-1/2 inches in thickness.

2.2.4 Drainage Filter Course: The drainage filter course shall consist of a well-graded aggregate course encased in a geotextile material and laid in such a manner to allow water to freely drain from the playing surfaces. The geotextile material shall be a woven or non-woven filter material with a minimum permeability of 0.02 cm/sec. The material shall be resistant to mildew, rotting, insects, rodents, and chemicals normally encountered in a subsurface drainage system.

2.3 Bituminous Concrete Playing Surfaces shall consist of a base course, prime coat, bituminous leveling course, tack coat, surface course, color coating and, where required, a drainage filter course, all constructed on a prepared subgrade. The stabilized-aggregate base course shall be compacted at optimum moisture to at least 95 percent CE 55 maximum density. Marshall stability shall not be less than 500 pounds and the flow shall not be greater than 20/100 inch. The bituminous mixture shall be compacted until the voids in the total mix are reduced to less than 4.0 percent by volume.

2.3.1 Thickness of Courses: Base course shall be 4 inches thick after compaction. Leveling course shall be 1-1/2 inches thick after compaction unless directed otherwise. Surface course shall be 1 inch thick after compaction.



2.3.2 Color Coating and Marking Paint: After curing of the bituminous surface course, the entire playing surface shall be covered with a color coat as required.

2.4 Portland Cement Concrete Playing Surfaces:

2.4.1 Aggregate: The nominal aggregate size shall be 1-1/2 inches to No. 4 sieve size and shall conform to ASTM C 33.

2.4.2 Portland Cement: The cement shall conform to ASTM C 150, Type IA or IIA; or ASTM C 595, Type IP-A.

2.4.3 Thickness: Horizontal Portland cement concrete playing surfaces shall consist of concrete slabs 4 inches thick.

2.5 Maintenance of Sand-Clay Surfaces: Prior to final acceptance, the Contractor shall make one application of 3/4 pound of calcium chloride per square yard to the sand-clay surface of the entire playing area.

2.6 Portable Outdoor Bleachers:

2.6.1 Bleachers shall be designed to support a uniformly distributed live load of 100 pounds per square foot of gross horizontal projection and a horizontal wind load of 30 lbs/sq ft of gross vertical projection. All seat and foot plank members shall be designed to support not less than 120 pounds per linear foot.

2.6.2 Wood Seating and Walk Boards shall be preservative-treated and painted.

2.7 Steel Basketball Poles: Minimum diameter 3-1/2 inches; galvanized pipe.

2.8 Running Track: Gravel and cinders over stone base; compaction to 90 percent of CE 55 maximum density. One hundred percent by weight of the gravel and cinders shall pass the 3/4-inch screen, and 90 percent of the gravel and cinders shall be retained on the No. 4 screen.

3.0 EXECUTION: (Section not used).

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SECTION 02861 RECREATIONAL FACILITIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous/recreational facilities. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Materials shall be resistant to corrosion and degradation by ultraviolet rays. Hardware and fittings shall be at least as corrosion-resistant as the materials fastened.

2.1.1 Steel Plates, Pipe, Tubing, Sheets, Wire Ropes, Chains, and Miscellaneous Shapes shall be stainless steel or galvanized steel, even if painted or coated with vinyl or other protective finish. All open pipe and tube ends shall have rain caps.

2.1.2 Wood shall be all-heart cedar, cypress, or redwood or shall be treated with a non-toxic preservative. Wood shall not be used where it will be in direct contact with the ground, unless approved by the Contracting Officer.

2.1.3 Fiberglass shall be smooth fiberglass-reinforced polyester with gelcoat coating and shall meet the following minimum physical properties: 22,000 psi flexural strength, 15,000 psi tensile strength, and 20,000 psi compressive strength.

2.1.4 Aluminum shall be anodized.

2.1.5 Foundations shall be 3,000 psi compressive strength concrete, reinforced as required. Provide embedded anchorage items as required.

2.2 Playground Equipment, shall include, but not be limited to, see-saws, slides, swings, whirlers, and monkey bars, shall be prefabricated and designed to withstand the anticipated structural loads.

2.2.1 Exposed Surfaces shall be smooth (except where required to be nonslip) seamless, and nonsplintering.

2.2.2 Steps, Platforms, and Other Flat Surfaces Subject to Foot Traffic shall be non-slip, but not abrasive and shall be formed to exclude or drain away water.

2.2.3 Fastening shall be flush, concealed, or otherwise formed or located to prevent injury to children playing on the equipment.

2.2.4 Slides shall have stainless steel sliding surfaces.

2.3 Bike Racks shall be mounted, and sections (if rack is sectional) shall be attached with tamper-proof fasteners.

2.4 Fiberglass Shelters shall be reinforced with steel, aluminum, or wood framework as required. Shelter roof shall be sloped to drain. Fiberglass edges shall be returned so that they are not exposed. Shelters shall be prefabricated and designed to withstand the anticipated live, dead, and wind loads.



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3.0 EXECUTION: Recreational facilities shall be installed plumb, aligned, and securely anchored to the ground. Adjust equipment with moving parts until operation is smooth and easy.

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Section 02921 Topsoil

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of topsoil. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Topsoil shall be the existing surface soil stripped and stockpiled on the site.

2.2 pH Adjusters:

2.2.1 Agricultural Limestone shall have a minimum calcium carbonate equivalent of 90 percent.

2.2.2 Other Liming Materials shall have a minimum calcium carbonate equivalent of 80 percent.

2.2.3 Aluminum Sulfate shall be commercial grade.

2.3 Soil Conditioners and Amendments:

2.3.1 Peat shall be a natural product conforming to ASTM D 2607.

2.3.2 Sand shall be clean and free of toxic materials.

2.3.3 Vermiculite shall be horticultural grade and free of any toxic materials.

2.3.4 Rotted Manure shall be unleached stable or cattle manure containing no chemicals or ingredients harmful to plants.

2.3.5 Rotted Sawdust shall be free of chips, stones, sticks, soil, and toxic substances.

2.3.6 Gypsum shall be 90 percent pure and free of any toxic materials.

2.4 Fertilizer shall be commercial grade, free flowing, uniform in composition and shall conform to applicable State and Federal regulations. Granular fertilizer shall conform to CID A-A-1909, Type I, Level B.

2.5 Soil Fumigant shall be 97 percent methyl bromide and 3 percent chloropicrin.

2.6 Mulch shall be straw, hay, or fiber mulch applied simultaneously with grass seed and fertilizer.

2.6.1 Straw shall be stalks from oats, wheat, rye, barley, or rice that are free from noxious weeds, mold, or other objectionable material.

2.6.2 Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, free from noxious weeds, mold, or other objectionable material.

2.6.3 Wood Cellulose Fiber for use with hydraulic application of grass seed and fertilizer shall consist of specially prepared wood cellulose fiber or a combination of wood cellulose and recycled newsprint fibers.



2.7 Asphalt Adhesive for application with straw or hay mulch shall be cutback asphalt conforming to ASTM D 2028, or emulsified asphalt conforming to ASTM D 977.

2.8 Herbicide and Pesticide use must comply with all applicable State and Federal laws.

3.0 EXECUTION:

3.1 Placing Topsoil: Topsoil shall be distributed uniformly and spread evenly to an average thickness of 3 inches, with a minimum thickness of 2 inches. Soil compacted by construction equipment or soil on compacted cut slopes of grades shall be pulverized to a minimum depth of 2 inches by disking or plowing before applying topsoil.

3.2 Application of Soil Conditioners: All fertilizers, pH adjusters, and soil conditioners shall be incorporated into the soil to a depth of at least 4 inches.

3.3 Application of Soil Amendments: Soil amendments shall be spread uniformly over the soil and thoroughly incorporated into the existing soil to a depth of 8 inches.

3.4 Mulch shall be spread uniformly in a continuous blanket, using 1-1/2 tons per acre.

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SECTION 02933 SODDING AND SEEDING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of seed and sod. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Seed shall be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Weed seed shall not exceed 1 percent by weight of the total mixture.

2.2 Sod shall be nursery grown, field sod, certified sod, or approved sod as classified in the ASPA Guideline Specifications to Turfgrass Sodding.

2.3 Sprigs shall be healthy living stems, stolons, or rhizomes and attached roots of grass without adhering soil. Sprigs shall include two to three nodes, shall be 4 to 6 inches long, and shall be obtained from approved sources where the sod is heavy and dense. Harvesting and planting operations shall be coordinated to prevent exposure of sprigs to the sun for more than 30 minutes before covering and moistening.

2.4 Water shall not contain elements toxic to plant life.

3.0 EXECUTION:

3.1 Preparation: Except on slopes steeper than 2 horizontal to 1 vertical, the soil shall be tilled to a depth of at least 4 inches. On slopes between 2 horizontal to 1 vertical and 1 horizontal to 1 vertical tillage, depths shall be 2 inches. On slopes steeper than 1 horizontal to 1 vertical, no tillage will be permitted.

3.2 Application:

3.2.1 Planting Seasons and Conditions: Planting shall not be done when the ground is frozen, snow covered, or in an unsatisfactory condition for planting.

3.2.2 Seed shall be broadcast uniformly. The seed shall be covered to an average depth of 1/4 inch.

3.2.3 Immediately After Seeding, the entire area shall be firmed with a roller and the soil moistened to a depth of 6 to 8 inches.

3.2.4 Sodding shall be accomplished in accordance with the ASPA Guideline Specifications to Turfgrass Sodding.

3.2.5 When Spot Sodding, the sod shall be cut into plugs 2 inches square or 2 inches in diameter. The individual pieces of sod shall be placed on 12-inch centers and pressed firmly into the soil by foot pressure or by tamping.

3.2.6 After Sod Pieces Have Been Placed in Position, the sodded area shall be rolled or tamped so that air pockets are eliminated.



3.2.7 Water Shall Be Applied to the sodded areas at a rate sufficient to ensure thorough wetting of the soil to a depth of at least 4 inches.

3.2.8 Sprigging: Sprigs shall be planted in such quantity as to provide a minimum of 25 viable sprigs or 108 linear inches of viable sprigs per square yard of areas.

3.2.8.1 Immediately After Sprigging Operations Have Been Completed, the planted area shall be firmed with a cultipacker or a roller.

3.2.8.2 Water Shall Be Applied at the time of sprigging operations wetting the soil to a depth of 4 inches.

3.2.9 Protection of Turfed Areas: Immediately after seeding, sodding, or sprigging, the area shall be protected against traffic or other use by erecting barricades, as required, and approved signs shall be placed at appropriate intervals until final acceptance.



SECTION 02940 LANDSCAPE IRRIGATION SYSTEM

1.0 DESCRIPTION OF WORK: This specification covers the complete irrigation system including: pipe, tubing, fitting, bubbler and emitter heads, control units, and all appurtenances necessary for an operating system. The system shall be Contractor designed, and installed with Contracting Officer approval.

2.0 PRODUCTS:

2.1 Piping and Fittings:

2.1.1 Copper Tubing: ASTM B 88, Type K; solder joint fittings, ASME B16.22 and B16.18 using 95-5 tin antimony solder.

2.1.2 PVC Pipe: ASTM D 1785, PVC 1120, Schedule 40 or 80, or ASTM D 2241, PVC 1120 SDR 21, Class 200; threaded or socket type, solvent cemented.

2.1.3 Polyethylene Pipe: ASTM D 2239, PE3406, SDR 15; insert fittings shall be used with stainless steel clamps.

2.1.4 Tubing for use with drip emitters shall be either polyethylene or polybutylene and shall have a minimum working pressure of 100 psi at 37 C.

2.2 Risers for Pop-up Bubbler Heads shall be of the double-swing joint type.

2.3 Application Devices shall be as specified herein.

2.3.1 Pop-up spray heads shall conform to Fed Spec WW-H-001220, Type II, class as required for the spray pattern needed.

2.3.2 Shrubbery sprinkler heads shall be brass nozzle type with adjustable conical spray coverage for permanent aboveground mounting or riser or pop-ups, height compatible with ground cover.

2.3.3 Bubbler heads shall be of the umbrella type in which the flow is evenly distributed around the perimeter of a flat plate on top of the bubbler. The bubbler shall be so adjustable as to provide half or full circle patterns and operating range of 20 psi to 90 psi. The flow rate shall be adjustable for gallonage and pressure by an easily accessible regulating screw.

2.3.4 Drip emitters shall be made of rigid, black, ultraviolet-resistant plastic. Each emitter head shall consist of at least two distinct pieces and be designed for easy and complete disassembly for cleaning. The emitters shall be capable of clog-free operation using water filtered through a 30-mesh screen. Emitters shall be multi-headed and shall be spaced to vary with soil conditions and wetted irrigation area.

2.4 Valves:

2.4.1 Gate valves less than 3 inches shall conform to MSS SP-80, Type 1, Class 150, with threaded or soldered ends.

2.4.2 Gate valves 3 inches and larger shall conform to AWWA C509, with flanged ends.

2.4.3 Pressure Reducing Valves: One valve shall be installed with each solenoid control valve. The valves shall be hydraulically operated, pilot operated, globe or angle type, and may be actuated either by diaphragm or piston. Valve bodies shall be bronze and shall conform to MSS SP-80, Type 1, Class 150.



Valve stem shall be stainless steel. Valve discs and diaphragms shall be synthetic rubber. Valve seats shall be bronze. Pilot controls shall be bronze with stainless steel working parts.

2.4.4 Solenoid control valves shall be heavy-duty, all brass construction suitable for 150 psi working pressure and shall be a globe-type diaphragm valve of normally closed design.

2.4.5 Manual drain valves less than 2-1/2 inches shall be MSS SP-80, Type 3, Class 150, with soldered or threaded ends. Manual drain valves 2-1/2 inches and larger shall be MSS SP-85, Type II, Class 250, with threaded or flanged ends.

2.4.6 Automatic drain valves shall be brass or plastic, spring-loaded ball drip type, 150 pounds, and threaded ends, designed to close at 6 foot pressure head with positive seal at 3 psi pressure or greater, and be open to drain at less than 3 psi pressure.

2.4.7 Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCHR-01. Backflow preventers with intermediate atmospheric vent shall be in accordance with ASSE 1012. Reduced pressure principle backflow preventers shall be in accordance with ASSE 1013.

2.5 Accessories:

2.5.1 Valve keys for manually operated valves shall be 1/2 inch diameter by 3 feet long, tee handles and keyed to fit valves.

2.5.2 Valve Boxes: Boxes shall be reinforced concrete pipe with cast-iron cover. Plastic valve boxes and covers, 9 in. inside diameter and self-draining, may be used as an option when approved by the Contracting Officer and in accordance with ASTM D 638. The word "IRRIGATION" shall be cast on cover.

3.0 EXECUTION:

3.1 Placing and Laying: Pipe shall not be laid in water or when trench conditions are otherwise unsuitable for the work. Water shall be kept out of the trench until the material in the joints has hardened or until caulking or jointing is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no substance will enter the pipes or fittings. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as shown or as directed.

3.2 Testing:

3.2.1 Hydrostatic Tests: After all new piping and risers are in place and prior to the installation of heads, each control valve shall be opened separately and the system shall be thoroughly flushed. After flushing, risers shall be capped and the entire system shall be subjected to a hydrostatic pressure test for a period of four hours. No testing shall be done until the last joint has had at least 12 hours to set. Leaking joints, cracked or defective pipe or valves shall be cut out and replaced and the complete test repeated until satisfactory results are obtained as approved by the Contracting Officer.

3.2.2 Operational Test: After the hydrostatic test, heads shall be installed and the system completed and tested to demonstrate functional efficiency. The entire system shall be operated on a normal basis for at least one month. Deficiencies such as clogging of emitters shall be corrected by the Contractor.



SECTION 02590 PAVEMENT MARKINGS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and replacement of pavement markings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Paint and reflective media shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer, manufacturer's name, formulation number, and directions, all of which shall be plainly legible at time of use. The paint shall be homogeneous and easily stirred to smooth consistency. Paint that is older than one year shall not be used.

2.2 Paint:

2.2.1 Paint for Roads and Streets shall comply with Fed. Spec. TT-P-85, Type I or II; Fed. Spec. TT-P-115, Type I, II, or III; or with Fed. Spec. TT-P-1952.

2.2.2 Paint for Airfields shall comply with Fed. Spec. TT-P-85, Type I or II or with Fed. Spec. TT-P-1952.

2.3 Reflective Media for Roads and Streets shall comply with Fed. Spec. TT-B-1325, Type I, gradation A.

2.4 Thermoplastic Materials shall comply with AASHTO M 249.

2.5 Raised Pavement Markers shall comply with the Federal Highway Administration Manual on Uniform Traffic Control Devices:

2.5.1 Reflective Pavement Markers: Reflective pavement markers shall be of the prismatic reflector type, consisting of a high impact plastic shell filled with a mixture of inert thermosetting compound and filler material.

2.5.2 Nonreflectorized Pavement Markers: Nonreflective pavement markers shall consist of a heat fired, white, vitreous, ceramic base and a heat-fired, opaque, glazed surface to produce the properties in these specifications.

2.6 Adhesive for Installation of Raised Pavement Markers shall comply with AASHTO M 237.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Safety and Protection: Contractor shall assure the least possible obstruction to traffic.

3.1.2 Removal of Existing Pavement Marking: Remove paint, plastic markings, and raised markers by sandblasting, infrared heat, high pressure water, and water or scraping. Heat may be used to augment scraping; however, the underlying pavement shall not be burned.



3.2 Installation:

3.2.1 Thermoplastic Applicator: Utilize extrusion or spray application equipment for applying thermoplastic material to the pavement. The equipment shall provide for varying widths of traffic markings.

3.2.2 Bead Dispensers: Attach bead dispensers to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line.

3.2.3 Tolerances in Dimensions and in Alignment: The length of the painted segment for skip stripe and the gap between segments may each vary plus or minus one foot, except that over-tolerance and under-tolerance lengths shall approximately compensate.

3.2.4 Protection: Adequate warning signs, flagmen, and necessary precautions for the protection of the wet paint and the safety of the public shall be provided. Cones, rubber "Z" guards or similar protective devices shall be placed along the newly painted stripe to prevent traffic from crossing the wet paint.

3.2.5 Corrective Measures: Stripes that fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected. Drip and spattered paint shall be removed.

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DIVISION 03 CONCRETE



SECTION 03105 CONCRETE FORMWORK

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural cast-in-place concrete formwork. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Form Materials shall conform to ACI 301 and shall be made especially for concrete form usage. The term "forms-in-place" shall be construed to mean form surface contact area of with concrete and shall include both form erection and removal.

2.1.1 Corrugated or Formed Steel Sheets: ASTM A 361, G90 Coating, with depth of corrugations not less than 1/2 inch.

2.1.2 Plywood: DOC PS 1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade. Minimum thickness shall be 3/4 inch. Steel lining on wood sheathing shall not be used.

2.1.3 Asbestos Cement Formboard: ASTM C 220, 1/4 inch thick, Type U or Type F.

2.1.4 Cylindrical Columns and Supports: Round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior. Reusable fiberglass column forms with a single vertical seam may be used.

2.1.5 Pan Type: 16-gauge steel with 1/4-inch thick concrete form hardboard conforming to AHA A135.4, or fiberglass at least 0.11 inch thick.

2.1.6 Lumber: Straight, uniform width and thickness and free from knots, offsets, holes, dents, and other surface defects. Minimum thickness shall be 1 inch.

2.1.7 Void Forms: Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of paper liners, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable.

2.1.8 Slip Forms: Shall be defined as continuously moving form moved by mechanical device during concrete placement.

2.2 Formwork Accessories:

2.2.1 Form Ties: Form ties shall be metal, factory-fabricated, removable or snap-off and will leave holes not less than 1/4 inch nor more than 1 inch in diameter and not more than 1 inch deep. Removable tie rods shall be not more than 1-1/2 inches in diameter.

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2.2.2 Form releasing agents shall be commercial colorless formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.2.3 Fillets for Chamfered Corners shall be wood strips or rigid plastic type.

2.2.4 Dovetail Anchor Slots shall be galvanized steel material with release-tape-sealed slots and bent tab anchors, securable to concrete formwork.

2.2.5 Flashing Reglets shall be galvanized steel with release-tape-sealed slots and alignment splines for joints, securable to concrete formwork.

2.2.6 Anchorages, Spikes, Nails, and Lag and Through Bolts shall be as required to maintain formwork in place.

3.0 EXECUTION:

3.1 Inspection: Forms shall be cleaned and reconditioned between usage. Temporary ports shall be provided in formwork to facilitate cleaning and inspection.

3.2 Preparation:

3.2.1 Formwork shall be constructed to maintain tolerances in accordance with ACI 301. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Unless pre-approved all formwork shall be removed.

3.2.2 Form Coating Shall Be Applied prior to placing reinforcing steel, anchoring devices, and embedded items. Do not apply form coating where concrete surfaces are scheduled to receive special finishes. Wood forms shall be wetted prior to concrete placement unless freezing weather is incurred.

3.2.3 Chamfer Strips shall be provided on external corners that will be exposed.

3.3 Form Removal: Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field-cured cylinders or other approved methods.



SECTION 03130 CONCRETE ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Joint Materials:

2.1.1 Rubberized Asphalt Compound: ASTM D 1190.

2.1.2 Polyurethane-Base Elastomeric: Fed. Spec. TT-S-230.

2.1.3 Asphalt Compound: ASTM D 1190.

2.1.4 Liquid Neoprene: Fed. Spec. SS-S-200.

2.2 Sealer: Fed. Spec. TT-S-00227.

2.3 Waterstop:

2.3.1 Polyvinyl Chloride: 1,750 psi minimum tensile strength, working temperature range from minus 51 F to plus 175 F, ribbed flaps on one side only.

2.3.2 Extruded Neoprene: 2,000 psi minimum tensile strength, 60 Shore A hardness, flush or recessed from joint.

3.0 EXECUTION:

3.1 Preparation: All surfaces of joints to which sealer is to be bonded shall be absolutely clean, dry, and free of loose concrete, dirt, oil, or other foreign material.

3.2 Application:

3.2.1 All Joints shall be in accordance with ACI 318.

3.2.2 Accessible Edges of expansion joint shall be sealed with sealer.

3.2.3 The Ambient Temperature shall be between 50 and 100 F when the primer and joint sealing compound are applied.

3.2.4 Contraction Joints shall have a minimum width of 1/8 inch and a depth of 1/4 the slab thickness or 1-1/2 inches minimum, whichever is greater.

3.2.5 Construction Joints shall be doweled construction.

3.2.6 Expansion Joint Filler shall be installed below the finished floor with a temporary wood strip to form a groove not less than 3/4 inch deep.

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3.2.7 Waterstops shall be installed so as to form a continuous water-tight diaphragm.



SECTION 03205 CONCRETE REINFORCEMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete reinforcement. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendation. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Reinforcement Materials:

2.1.1 Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M or ASTM A 706/A 706M, grades and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. In highly corrosive environments or when directed by the Contracting Officer, reinforcing steel shall conform to ASTM A 767/A 767M or ASTM A 775/A 775M as appropriate.

2.1.2 Welded Steel Wire Fabric: ASTM A 185 for plain type and ASTM A 497 for deformed type fabric. Epoxy Coated welded wire fabric shall comply with ASTM 884/A 884M, Class A plain or deformed steel.

2.1.3 Stirrup Steel: ASTM A 82.

2.1.4 Dowel Steel: ASTM A 675, Grade 80 or ASTM A 499. Steel pipes dowels shall be closed at each end with mortar, metal, or plastic cap, and shall conform to ASTM A 53, Schedule 80.

2.1.5 Epoxy-coated Fabricated Reinforcing Bars: ASTM A934/A 934M and as follows: Steel Reinforcement, ASTM A615/A 615 M, Grade 60, deformed.

2.1.6 Fiber Reinforcement: Carbon-Steel Fiber; ASTM A820 deformed, minimum 2.4 inches long. Synthetic Fiber; fibrillated polypropylene engineered and designed for use in concrete complying with ASTM C1116, Type III, ½ to 1-1/2 inches long.

2.2 Reinforcement Accessories:

2.2.1 Wire Ties: 16 gauge black annealed wire or epoxy coated when epoxy coated steel is in use.

2.2.2 Chairs, Bolsters, Bar Supports, and Spacers shall be provided in conformance with ACI SP-66. Supports for formed surfaces exposed to view shall be plastic protected wire or stainless steel. Precast concrete, if used for bar supports, shall be wedge-shaped, not larger than 3-1/2 inches by 3-1/2 inches in thickness and with an embedded hooked tie wire for anchorage. Epoxy accessories shall be provided for epoxy coated steel reinforcement.

3.0 EXECUTION:

3.1 Regulations:

3.1.1 Reinforcement Detailing and Placement shall conform to ACI 318 and Concrete Reinforcing Steel Institute's CRSI MSP-1 "Manual of Standard Practice".

3.1.2 Laps or Splices shall conform to ACI 318.

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3.1.3 Welding shall comply with American Welding Society's AWS D1.4.

3.2 Installation: Reinforcement shall be placed in accordance with ACI 318M at locations shown plus or minus one bar diameter.

3.2.1 Reinforcement shall be free from loose or flaky rust and mill scale.

3.2.2 In Slabs, Beams, and Girders, reinforcing steel shall not be spliced at points of maximum stress.

3.2.3 Dowels and Tie-Bars in slabs on grade shall be placed at right angles to construction joints.

3.2.4 Wire Fabric Reinforcement shall be continuous between expansion, construction, and contraction joints in slabs on grade and between expansion joints in other slabs. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost cross-wires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction.

3.2.5 Reinforcing Bars shall not be continuous through expansion joints but shall be 2 inches clear from the joint.



SECTION 03227 STEEL STRESSING TENDONS FOR PRESTRESSED CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete steel stressing tendons and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendation. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Stressing Tendons and Accessories shall conform to the requirements of ACI 318/318R except as specified. Stressing Tendons shall be clean and free of loose rust, scale or pitting. Unbonded tendons shall be permanently protected from corrosion with an approved applied coating.

2.1.1 Seven-wire stress-relieved strand and strand assemblies shall conform to ASTM A 416/A 416M, Grade 250 or 270, strand diameter as shown. Strand assemblies may be either shop or field assembled with anchor fittings positively attached to strands.

2.1.2 Stress-relieved wire and wire assemblies shall conform to ASTM A 421, Type BA or WA, wire diameter as shown. Wire assemblies shall be shop assembled with anchor fittings positively attached to wires.

2.1.3 High-strength steel bars shall conform to ASTM A 722/A 722M, Type I or II, and meeting all supplementary requirements.

2.2 Tendon Ducts: Tendon ducts shall be of ferrous metal, capable of transmitting forces from the grout to the surrounding concrete. Ducts shall be flexible enough to conform to the tendon profile and strong enough to maintain their shape without deforming, sagging, or collapsing during concrete placement and vibration. The inside diameter of the ducts shall be large enough to provide an internal area at least twice the gross area of multiple wire, bar or strand assemblies. Ducts shall be at least 1/4-inch larger than the diameter of a single wire, bar or strand placed in the ducts. Ducts shall be designed for watertight connections with all fittings. Galvanized ducts will not be permitted.

2.3 Anchorage and Couplers shall be metal of proven corrosion resistance and compatible with the stressing tendons, capable of fully developing the minimum guaranteed ultimate strength of tendons without excessive slip and approved. Anchorages shall be the button-head, wedge, nut and thread, grip nut, thread-bar, threaded plate or other approved type and shall be provided with bearing plates bars, rings, bells or other positive-attaching anchor fittings. Couplers shall be provided with housings long enough to permit the necessary movements and fittings allowing for complete grouting of all components.

2.4 Grout for grouting post-tensioned tendons shall consist of a mixture of Portland cement, shrinkage compensating admixture and potable water of which final proportions shall be based on test results of sample mixtures. Cement shall conform to ASTM C 150, Type I or II. The shrinkage compensating admixture shall produce a 2 percent minimum and a 10 percent maximum unconfined expansion when tested in accordance with ASTM C 940. Admixture shall not contain aluminum powder, chlorides, fluorides or nitrates, may be dispensed in solid or liquid form and must be approved by the Contracting Officer prior to its use. The water content shall be the minimum necessary for proper placement but the water-cement ratio shall not exceed 0.50 by weight. The pumpability of grout shall be determined in accordance with ASTM C 939. The efflux time of a grout sample immediately after mixing shall not be



less than 11 seconds. The minimum 7-day compressive strength of 2-inch grout cubes, molded, cured and tested in accordance with ASTM C 109/C 109M shall be 2500 psi.

3.0 EXECUTION:

3.1 Installation: Stressing tendons and accessories shall be installed or placed as specified and as shown on contract and approved installation drawings. Installation details of stressing tendons and accessories not specified or shown shall be in accordance with ACI 318/318R. Welding shall not be performed near or adjacent to stressing tendons. Stressing tendons shall not be installed until all welding has been completed on supports or any part which might be in contact with the tendons.

3.1.1 Prestressing Method and Equipment; Descriptions of the proposed prestressing methods and equipment indicating the manufacturer of all prestressing equipment, including tensioning jacks, stress measurement gages, dynamometers and load cells or other devices for measuring stressing loads, shall be provided by the contractor. Descriptions shall include certified calibration records for each set of jacking equipment and testing curves for stress measurement gages which show that the gages have been calibrated for the jacks for which they are to be used.

3.1.2 Anchorages must be set in a plane normal to the axis of the tendons such that uniform bearing on the concrete is assured. Positive connecting anchorages rather than gripping types shall be used for anchoring embedded ends of tendons. Anchorages and anchor fittings shall be permanently protected against corrosion. Parallel wire anchorage wedges or cores shall be recessed within the members.

3.1.3 Stressing Tendons and Ducts; Protective coverings and wrappings shall be removed and each stressing tendon shall be closely inspected to see that nicks, scoring, pits or other damage does not exist. High-strength steel bars shall be closely inspected to assure that they are not bent and that threaded ends are in satisfactory condition immediately prior to installation. Strand, wire and bar tendons shall be shop or field assembled as required and positively attached to anchorages. Type WA wire assemblies shall be anchored only with wedge type anchorages. Stressing tendons and ducts shall be assembled to required shapes and dimensions and placed where indicated on drawings within specified tolerances and adequately supported. Ducts shall be securely fastened at close intervals and grout openings and vents must be securely anchored to ducts and to either the forms or reinforcing steel to prevent displacement during concrete placing. The ends of ducts shall be effectively protected to prevent entry of water, concrete, grout or debris. Wires of parallel-wire assemblies shall not be spliced. Steel bar tendons may be joined by couplers where shown or approved, provided they are capable of developing the guaranteed minimum ultimate strength of the bars. Strands to be spliced shall have the same lay or direction of twist and the ends shall be cut by shears or abrasive grinders. No more than one strand shall be spliced in any one member where single strand tensioning is employed. Strand splices shall be capable of developing the full ultimate strength of the strand. Slippage of the splice shall be checked and correction made for differential slippage. Where multiple strand tensioning is used, not more than 10 percent of the strands in any member shall be spliced.

3.1.4 Tensioning Tendons: Tensioning of stressing tendons shall be as specified and shown. The stress induced in the tendons by any method of tensioning shall be determined independently by both (1) measurement of tendon elongation and (2) direct measurement of force using a pressure gauge or load cell. If the results of these two measurements do not check each other and the theoretical values within 5 percent, the operation shall be carefully checked and the source of error determined and corrected before proceeding further. Concrete cylinder tests shall indicate a breaking strength of at least 80% of the design compressive strength before transfer of stress. This ensures that the concrete strength is adequate for the requirements of the anchorages, or for transfer through bond as well as meeting camber or deflection requirements. The final prestress load in each unit after seating shall be as shown. Safety measures shall be taken by the Contractor to prevent accidental injury caused by failure of a stressing tendon or tendon



component. The exposed ends of stressing tendons and anchorages shall be protected from damage during stressing operations to prevent failure.

3.1.4.1 Pretensioning: Strand tendons may be tensioned by jacking of groups of strands or may be tensioned individually by means of a single-strand jack. Before final tensioning, all tendons shall be brought to a uniform initial tension of approximately 1,000 pounds per strand/per 200 feet of bed, with a minimum of 1,000 pounds and a maximum of 3,000 pounds per strand. The force corresponding to the initial tension shall be measured by a dynamometer or other approved method to aid in determining the final elongation. After this initial tensioning, the tendons shall be stressed to the total tension indicated on the drawings using hydraulic or mechanical equipment with gauges or dynamometers graduated and calibrated to accurately determine the load applied. Draped pretensioned strands shall be tensioned partially by jacking at the end of the bed and partially by uplifting or depressing strands, or they shall be held in their draped positions by means of rollers, pins or other approved methods and tensioned entirely by jacking. Approved low-friction devices shall be used at all points of change in slope of draped strands while tensioning draped strands, regardless of the tensioning method used. Cable stress shall be maintained between anchorages until the concrete has reached the specified compressive strength.

3.1.4.2 Detensioning: Forces from pretensioned strands shall be transferred to the concrete by either the multiple-strand release or the single-strand release method. The stress transfer shall not be performed until concrete strength, as indicated by test cylinders, has reached the specified transfer strength. If concrete has been heat-cured, the detensioning shall be done immediately following the curing period while the concrete is still warm and moist. During detensioning, the prestressing forces shall be kept nearly symmetrical about the vertical axis of the member and shall be applied in a manner that will minimize sudden loading. Eccentricity about the vertical axis shall be limited to one strand.

- a. Multiple-Strand Release: In this method, all strands shall be detensioned simultaneously and the load transferred gradually to the concrete by hydraulic jacking.
- b. Single-Strand Release: In this method, all strands shall be detensioned by slow heat-cutting the strands in accordance with a pattern and schedule as approved. The strands shall be heated using a low-oxygen flame until the metal gradually loses its strength, causing release of the strands to occur gradually. The low-oxygen flame shall be played along the strand for a minimum of five inches. Strands shall be so heated that the failure of the first wire in each strand shall occur after the torch has been applied for a minimum of five seconds.

3.1.4.3 Post-Tensioning: Tensioning shall not be performed until the concrete has reached the required strength at transfer of stress. Before final tensioning of tendons, all tendons shall be brought to a uniform initial tension of approximately 10 percent of the full load. The force corresponding to the initial tension shall be measured by a dynamometer or other approved method as a starting point in determining final elongation. A temporary overstress above the final prestress force as approved by the Contracting Officer shall be used to overcome stress losses. The units shall be tensioned until the proper elongations and jacking pressures are attained and reconciled within the limits stated above. Straight tendons may be tensioned from one end. Curved or draped tendons shall be stressed by simultaneous jacking from both ends using a common pump with identical hoses and jacks, unless otherwise shown.

3.1.5 Grouting Post-Tensioned Tendons Grouting between each tendon and its enclosing duct shall be performed within 5 days after completion of the tensioning operation. Grouting shall not be performed if air temperature below 45 degrees F is anticipated within 48 hours after grouting unless an approved method of temperature control is used. The grout shall be mixed in a mechanical mixer of a type that will produce uniformly and thoroughly mixed grout. First water shall be placed in the mixer followed by cement and admixture. Grout shall be continuously agitated until it is pumped. Grout that has begun to set shall be discarded. Just before grouting, the ducts shall be flushed with clean water and then blown clear by compressed air to removed excess water. With the grout vent open at one end of duct, grout shall be applied continuously under moderate pressure at the other end until all entrapped air is forced out as

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indicated by a uniform flow of grout from the discharge vent. The discharge vent shall then be closed and the pressure raised to 50 psi minimum and held for at least 1 minute. The injection point shall then be closed by an approved means to prevent any loss of grout. For a period of at least 3 days after grouting the tendons, the prestressed members shall not have equipment or other loads placed on them. A longer period may be required, depending upon the method of curing and magnitude of imposed stresses.

3.1.6 Accuracy of Stress and Elongation Measurement

3.1.6.1 Stress Measurement Hydraulic gauges, dynamometers, load cells or other devices for measuring stressing load shall have an accuracy of reading within two percent for stress measurement. Gauges are required to have been calibrated for the jacks for which they are used within a period not exceeding 12 months. Recalibration shall be performed at any time that a gauging system shows indication of erratic results in the opinion of the Contracting Officer. Gauges shall indicate loads directly in pounds or be furnished with a conversion chart.

3.1.6.2 Elongation Measurement After the initial force has been applied to a tendon, reference points for measuring elongation due to additional tensioning forces shall be established. They shall be located according to the method of tensioning and type of equipment. The system used shall be capable of measuring the true elongation plus or minus 1/16-inch.

3.1.7 Prestressing Operations Records; The contractor shall compile and submit complete prestressing operations records to the Contracting Officer. These records shall show the manufacturer, identification and description of materials and equipment including prestressing tendons and jacking and load measuring equipment; location of prestressing tendons; initial design tensioning loads, final design tensioning loads and actual tensioning loads for tendons; dates tensioning loads applied; and theoretical and actual elongations for tendons.



SECTION 03305 CAST-IN-PLACE CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cast-in-place concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Admixtures:

2.1.1 Air-Entraining Admixture: ASTM C 260.

2.1.2 Accelerating Admixture: ASTM C 494 Type E.

2.1.3 Water-Reducing or Retarding Admixture: ASTM C 494 Type D.

2.2 Concrete Mixture:

2.2.1 Portland Cement:

2.2.1.1 Cement shall comply with ASTM C 150, Type I, low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II, low alkali or Type V. White portland cement shall meet the above requirements except that it may be Type I, Type II or Type III, low alkali. White Type III shall be used only in specific areas of the structure, when approved in writing.

2.2.1.2 High-Early-Strength Portland Cement ASTM C 150, Type III with tricalcium aluminate limited to 8 percent, low alkali. Type III cement shall be used only in isolated instances and only when approved in writing.

2.2.2 Normal Weight Aggregate: ASTM C 33. Lightweight fine and coarse aggregates shall conform to the quality and gradation requirements of ASTM C 330.

2.2.3 Water: Potable, free from deleterious substances.

2.2.4 Proportion of Cement, Aggregate, and Water shall comply with ACI 318.

2.2.5 Specified compressive strength (f'_c) shall be as selected with compressive strength measured at 28 days. Concrete slabs on-grade shall have a 28-day flexural strength of 650 psi. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined in accordance with ASTM C 78. Water-cement ratio by weight shall be 0.40 unless otherwise approved by contracting officer. Slump shall be determined in accordance with ASTM C 143 as measured at point of placement. The air content shall be between 5.5 and 8.5 percent. Air content for concrete shall be determined in accordance with ASTM C 173.

2.3 Concrete Accessories:

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2.3.1 Bonding Agent shall be two component epoxy resin, two component polysulphide-epoxy, polysulphide polymer epoxy, or polysulphide polymer epoxy resin.

2.3.2 Vapor Barrier shall consist of 6-mil polyethylene sheet, complying with ASTM C 171, or heavy kraft papers laminated together with glass fiber and overcoated with polyethylene.

2.3.3 Floor Hardener:

2.3.3.1 Metallic Floor Hardener: Magnesium fluosilicate and zinc fluosilicate with water.

2.3.3.2 Non-Metallic Floor Hardener shall be used when hardened floor is subject to light or medium floor traffic.

2.3.4 Colored Pigments: Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.

3.0 EXECUTION:

3.1 Concrete Placement:

3.1.1 Formwork, Reinforcing Steel, and Embedment Items shall be inspected before placing concrete.

3.1.2 Concrete Placement shall comply with ACI 304 and 301.

3.1.3 Cold Weather Placing shall be in compliance with ACI 306. Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494, Type C or E may be used, provided it contains no calcium chloride.

3.1.4 Hot Weather Placing shall be in compliance with ACI 305. Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit.

3.1.5 Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.2 Concrete Finishes shall comply with ACI 301.

3.2.1 Float Finish shall be applied to monolithic slab surfaces receiving trowel finish or slab surfaces to be covered with membrane or elastic waterproofing.



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3.2.2 Trowel Finish: Power-driven troweling or hand troweling shall be applied to monolithic slab surfaces to be exposed to view and slab surfaces covered with resilient flooring.

3.2.3 Broom Finish shall be applied to exterior concrete platforms, stairs, ramps, etc.

3.2.4 Rough Slab Finish: Slabs shall be screeded with straight edges so that no coarse aggregate is visible and slab is suitable to receive fill and mortar setting beds.

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SECTION 03334 CONCRETE CURING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for concrete curing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Impervious Sheet Materials: ASTM C 171.

2.2 Burlap: AASHTO M 182

2.3 Membrane-Forming Compound: ASTM C 309, Type I.

3.0 EXECUTION: Concrete shall be cured by protection against loss of moisture and rapid temperature change for a period of not less than 7 days for normal concrete or 3 days for high early strength concrete in accordance with ACI 301 procedures.

3.1 Absorptive Cover shall be placed to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

3.2 Horizontal Surfaces shall be cured by ponding, by covering with a 2-inch minimum thickness of continuously saturated sand, or by covering with polyethylene sheet, saturated burlap, or waterproof paper.

3.3 Formed Surfaces shall be cured by moist curing with forms in place for full curing period. Wooden forms shall be kept wet at all times during curing.

3.4 Unformed Surfaces, such as slabs and other flat surfaces, shall be cured by application of appropriate curing compound.

3.5 Membrane-Curing Compound shall not be applied where a protective coat or waterproofing is to be expected.



SECTION 03351 EXPOSED AGGREGATE CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of exposed aggregate finish on concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. In the case of conflicts between work described in Section 03305 Cast-In-Place Concrete and this section, 03305 shall prevail.

2.0 PRODUCTS:

2.1 Cement: ASTM C 150, Type I Portland cement.

2.2 Admixtures: ASTM C 494, ASTM C 260.

2.3 Aggregate: ASTM C 33.

2.4 Water: Clean, potable.

2.5 Cleaning Agent: Commercial grade muriatic acid, mixed 1 part acid to 10 parts water.

2.6 Bonding Agent: Polyvinyl acetate emulsion.

2.7 Surface Aggregate: As directed by contracting officer.

3.0 EXECUTION:

3.1 Concrete Shall Be Placed and Vibrated to ensure that concrete is consolidated and that all voids are filled

3.2 Formed Concrete:

3.2.1 Leave Forms in Place until removal can be effected without damage to the shape or strength of the concrete but, in no case, in less than 24 hours. A longer period will be required when lower ambient temperatures are experienced.

3.2.2 Immediately After Removal of Form Work, remove surface cement paste from around aggregate by either washing with water and scrubbing with a stiff bristle brush, wetting and scrubbing surface with acid etch solution, or sandblasting surface.

3.2.3 Cover Concrete and continue curing procedures.

3.3 Slabs:

3.3.1 Allow Concrete to Cure until slab can be loaded without structural damage but, in no case, in less than 24 hours.

3.3.2 Uncover Slab and remove surface cement paste from around aggregate, using methods described for the removal of paste from formed concrete.

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3.3.3 Cover Concrete and continue curing procedures.

3.4 Exposure: Do not expose more than 40 percent of aggregate surface.

3.5 Surface-Applied Aggregate:

3.5.1 Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Contracting Officer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete. Cleaned surfaces of well-bonded coarse aggregate shall be exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse aggregate shall not be undercut.

3.5.2 Wetting Surface The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift.

3.5.3 Bonding Agent For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand passing the No. 8 sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

3.5.4 Provide Proper Curing Conditions for exposed aggregate surface.

3.6 Sample: A sample of finish expected shall be erected on site. Completed work shall approximate the sample. Work determined by the contracting officer not to be similar shall be removed and replaced without further expense to the owner.



SECTION 03352 RUSTICATED CONCRETE FINISHES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rusticated concrete finishes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Overlaid Plywood: DOC PS 1, B-B High Density Overlaid Concrete Form, Class I.

2.2 Plywood: DOC PS 1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.

2.3 Chamfer Strips: Clear white pine with surface against concrete to be planed, metal, PVC, or rubber.

2.4 Form Liners: Provide commercially available molds and form-facing materials of metal, plastic, mood, or another material that is nonreactive with concrete and dimensionally stable to produce repetitive concrete surfaces.

3.0 EXECUTION:

3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth exposed surfaces. Forms shall be fabricated for easy removal without hammering or prying against concrete surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste. Provisions shall be made for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, inserts, and other features required in the work.

3.2 Form Coatings: Forms shall be oiled with form-coating compounds that will not bond with, stain, nor adversely effect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided not less than one day after form removal.

3.4 Sample: A sample of finish expected shall be erected on site. Completed work shall approximate the sample. Work determined by the contracting officer not to be similar shall be removed and replaced without further expense to the owner.

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SECTION 03353 SOLID BOARD CONCRETE FINISHES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of solid board concrete finishes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Overlaid Plywood: DOC PS 1, B-B High Density Overlaid Concrete Form, Class I.

2.2 Plywood: DOC PS 1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.

2.3 Fiberboard: AHA A135.4, tempered, waterproof, screen back, concrete form hardboard.

3.0 EXECUTION:

3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth, exposed surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste. Metal form patches are not allowed.

3.2 Form Coatings: Forms shall be coated with form-release-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided no later than one day after concrete placement.



SECTION 03354 FLEXURAL CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of flexural concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cement: ASTM C 150.

2.2 Fine and Coarse Aggregates: ASTM C 33.

2.3 Admixtures:

2.3.1 Air-Entraining Agents: ASTM C 260.

2.3.2 Retarders: ASTM C 494.

2.3.3 Pozzolans: ASTM C 618.

2.4 Mixture Proportions:

2.4.1 Flexural concrete designs shall conform to the requirements specified for Normal Weight Concrete. Proportions shall be based on flexural strength as determined by test specimens (beams) fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 78. Procedures given in ACI 211.1 shall be modified as necessary to accommodate flexural strength.

2.4.2 Concrete slabs on-grade shall have a 28-day flexural strength of 650 psi. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined in accordance with ASTM C 78.

3.0 EXECUTION:

3.1 Placing: Concrete shall be deposited in the forms or in front of slip-form pavers within 45 minutes from the time all ingredients are charged into the mixing drum. Concrete shall be deposited as close as possible to its final position. The placement of the concrete shall be continuous and at a uniform rate without unscheduled stops. Concrete shall be consolidated with mechanical vibrating equipment immediately after spreading.

3.2 Finishing Operations shall be started immediately after placement of the concrete. Finishing shall be by the machine method. Where directed, the hand method will be permitted on odd slab widths or shapes. In event of breakdown of the mechanical equipment, hand finishing will be allowed. The sequence of operations shall be as follows: straight edging, bull floating, floating, texturing or troweling, and, where directed, edging of joints.

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3.3 Curing: Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. Protection shall be provided as necessary to prevent cracking due to temperature changes during the curing period.



SECTION 03356 GROUT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grout for bases and joints. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Grouts to be used in structural applications shall be approved for use by contracting officer.

2.1 Premixed Grout shall contain cement, sand, and admixtures to produce a non-shrinking grout with the addition of potable water. Expansion shall be limited to 0.10 percent at 28 days.

2.1.1 Metallic Grout shall be non-rusting, containing finely graded metallic aggregate with a compressive strength of 12,000 psi at 28 days.

2.1.2 Non-Metallic Grout shall have a compressive strength of 13,000 psi at 28 days.

2.1.3 Fluid Grout shall be a non-metallic grout with flowable consistency.

2.2 Field-Mixed Grout: Grout shall contain 1 part cement to 3 parts sand by volume, with the water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed.

3.0 EXECUTION:

3.1 Baseplates shall be grouted with non-shrinking grout. Grout shall be placed so that all spaces and cavities below the top of base plates are completely filled without voids. Forms shall be provided where structural components of base plates will not confine the nonshrinking grout.

3.2 Joints shall be filled with field-mixed grout by tamping or ramming with a bar or rod until the joint is completely filled. Grout surface shall be smooth-finished and level with the adjoining material.

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SECTION 03362 SHOTCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of shotcrete placed concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Portland Cement: Portland cement shall meet the requirements of ASTM C 150, Type I or III.

2.2 Pozzolan Other Than Silica Fume: Pozzolans shall conform to ASTM C 618, Class C or F.

2.3 Ground Granulated Blast-Furnace Slag: Slag shall conform to ASTM C 989.

2.4 Silica Fume: Silica may be furnished as a dry, densified material or as a slurry. Silica fume, unprocessed, or before processing into a slurry or a densified material, shall conform to ASTM C 1240.

2.5 Normal-Weight Aggregates: ASTM C33, Class 4X. Provide aggregates from a single source.

2.6 Lightweight Aggregates shall comply with ASTM C330.

2.7 Water: Fresh, clean, potable mixing water or nonpotable water which meets the requirements of COE CRD-C 400 shall be used.

2.8 Admixtures: Admixtures to be used, when required or approved, shall comply with the appropriate sections of ASTM C 1141. Except as otherwise accepted, soluble admixtures shall be dissolved in water before introduction into the shotcrete mixture.

2.9 Curing Materials:

2.9.1 Impervious Sheet Materials ASTM C 171, type optional except polyethylene film, if used, shall be white opaque.

2.9.2 Membrane-Forming Curing Compound ASTM C 309, Type 1-D or Type 2.

2.10 Reinforcement:

2.10.1 Steel Fiber Reinforcement shall meet the requirements of ASTM A 820 and ASTM C1116, Type 1 not less than 1 inch long.

2.10.2 Synthetic Fibers, polypropylene fibers designed for secondary reinforcement of shotcrete, complying with ASTM C 1116, Type III, not less than 1-1/2 inches long.

3.0 EXECUTION:

3.1 Batching and Mixing Methods: The shotcrete shall be produced by either the wet-mix process or the dry-mix process. Aggregate and cementitious materials may be batched by mass or by volume. Equipment for batching by mass shall be capable of the accuracy specified in ASTM C 94. Volumetric equipment shall be



capable of batching with the accuracy specified in ASTM C 685. The mixing equipment shall be capable of thoroughly mixing the materials in sufficient quantity to maintain placing continuity and be capable of discharging all mixed material without any carryover from one batch to the next.

3.2 Certified Nozzlemen: All nozzlemen shall be certified in accordance with ACI 506.3R. Qualifications of additional nozzlemen throughout the job shall be similarly submitted for approval.

3.3 Test Panels: Specimens of the test panels shall be made by each application crew using the equipment, materials, mixture proportions, and procedures for each mixture being considered, and for each shooting position to be encountered in the job.

3.4 Accelerators: When accelerating admixtures are to be used; the Contractor shall establish the accelerator compatibility of the job cement and the proposed accelerators using ASTM C 266, except as modified herein. The powdered accelerator shall be blended with 50 grams of cement until uniform and 15 milliliters of water shall then be added. The liquid accelerator shall first be mixed with 15 milliliters of water and then added to 50 grams of cement. Three percent of the proposed accelerator by mass of cement shall be used as a starting point. Mixing shall be accomplished within 15 seconds. The specimen shall be molded within 1 minute of adding the mixing water. If initial set is 2 minutes or less and a final set is 10 minutes or less, the accelerator is considered compatible. If these values are not achieved in the first test, additional tests shall be run using 2 percent and 4 percent of accelerator.

3.5 Air Supply: Provide a supply of clean, dry air adequate for maintaining sufficient nozzle velocity for all parts of the work and for simultaneous operation of a suitable blowpipe for clearing away rebound.

3.6 Preparation of Surfaces: Earth shall be trimmed to line and grade and dampened. Existing concrete shall have unsound material and protrusions removed, edges tapered, and the surface dampened. Rock surfaces shall be cleaned to remove loose or drummy material, mud, running water, and other foreign matter that will prevent bond of the shotcrete. The rock surface shall be dampened prior to placement of shotcrete.

3.7 Finishing:

3.7.1 Natural Gun Finish Unless otherwise specified, undisturbed final layer of shotcrete as applied from nozzle without hand finishing shall be provided.

3.7.2 Cutting Screed: After the surface has taken its initial set (crumbling slightly when cut), excess material outside the forms and ground wires shall be sliced off with a downward cutting motion using a sharp-edged cutting screed.

3.7.3 Flash Coat: A thin coat of shotcrete containing finer sand applied from a distance greater than normal shall be applied to the surface as soon as possible after the screeding.

3.7.4 Float and Trowel Finish: Final surface finish shall be provided using wood float, rubber float or steel trowel. Troweling of thin sections of shotcrete shall be avoided unless both troweling and commencement of moisture curing take place within a relatively short period after placement of shotcrete.

3.8 Curing: Immediately after finishing, shotcrete shall be kept continuously moist for at least 3 days.

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SECTION 03372 SPECIALLY PLACED CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumped concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Pumps shall pump a minimum of 50 cubic yards of concrete per hour and shall be appropriately sized for the project.

2.1.1 Piston Type: Pump shall draw alternately from a hopper into the discharge pipe by a piston, operated mechanically or hydraulically.

2.1.2 Pneumatic Type: Pneumatic type placing equipment shall not be used. Defined as; Air pressure forcing the concrete into the discharge pipe.

2.1.3 "Squeeze" Type: Pump-powered rollers shall deform a concrete-filled flexible tube to push the concrete into the discharge pipe.

2.2 Discharge Lines: The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Use of flexible hose is to be minimized.

- a. 4- to 6-inch steel pipe.
- b. Aluminum pipe shall not be used.
- c. 4- to 5-inch rubber hose.

2.3 Hopper: 15 to 20 cu ft concrete capacity.

3.0 EXECUTION:

3.1 Slump Loss shall be less than one inch while passing through the pumping system.

3.2 When Concrete Must be Pumped long distance, a relay system shall be installed (one pump feeds into the hopper of another pump).

3.3 Placing Concrete by Pumping Methods shall comply with ACI 304.2R.

3.4 Grout Slurry: The use of an appropriate quantity of a grout slurry is required to prepare slick line for use at the beginning of each placement.



SECTION 03399 ROLLER-COMPACTED CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of roller compacted concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cementitious Materials:

2.1.1 Portland Cement Portland cement shall conform to ASTM C 150, Type I. Low alkali is to be used with aggregates when directed. In lieu of low-alkali cement, the Contractor may use a combination of portland cement that does not meet the low-alkali requirement with a suitable pozzolan or ground granulated blast-furnace slag (GGBFS) provided the following requirement is met. The expansion of the proposed combination shall be equal to or less than the expansion of a low-alkali cement meeting the requirements of ASTM C 150 when tested in conformance with ASTM C 441. These two tests shall be performed concurrently at an independent certified laboratory at the Contractor's expense. The Government reserves the right to confirm the test results and to adjust the percentage of pozzolan or GGBFS in the combination to suit other requirements at no additional cost to the Government. Portland cement shall be furnished in bulk.

2.1.2 Pozzolan Pozzolan shall conform to ASTM C 618, and, in addition, limits in Table 2A, Uniformity Requirements (for air content) shall apply to all fly ash. Table 1A, Supplementary Optional Chemical Requirement for Maximum Alkalies, shall apply when it is to be used with aggregates listed to require low-alkali cement]. Pozzolan shall be furnished in bulk.

2.1.3 Temperature of Cementitious Materials The temperature of the cementitious materials as delivered to the site shall not exceed 150 degrees F.

2.2 Admixtures: All chemical admixtures furnished as liquids shall be in a solution of suitable viscosity and dilution for field use as determined by the Contracting Officer.

2.2.1 Water-Reducing Admixture (WRA) shall meet the requirements of ASTM C 494, Type D.

2.2.2 Air-entraining admixture shall conform to ASTM C 260.

2.3 Water: Water for washing aggregates and for mixing and curing concrete shall be free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances and shall comply with COE CRD-C 400.

2.4 Aggregates

2.4.1 Composition Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sands. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, air-cooled blast-furnace slag, or a combination thereof.

2.4.2 Composition All concrete mixtures will be proportioned by the Contracting Officer except that proportions for the slipformed facing concrete mixture will be selected by the Contractor. RCC shall be composed of cementitious materials, water, fine and coarse aggregates, and possibly admixtures. The

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cementitious material shall be portland cement, or portland cement in combination with pozzolan. An admixture when approved or directed will be a water-reducing/retarding admixture. Air-entraining admixture will be used in the bedding concrete and other conventional concrete.

3.0 EXECUTION:

3.1 Concrete Mixing Plant: A continuous mixing plant(s) shall be capable of producing RCC of the same quality and uniformity as would be produced in a conventional redi-mix batch plant and shall be capable of producing a uniform continuous product (at both maximum and minimum production rates) that is mixed so that complete intermingling of all ingredients occurs without balling, segregation, and wet or dry portions.

3.2 Trucks: Truck mixers or agitators used for transporting central-mixed conventional concrete shall conform to the applicable requirements of ASTM C 94. Truck mixers shall not be used to transport concrete with larger than 37.5 mm (1-1/2-inch) nominal maximum size aggregate (NMSA) or 2 inch slump, or less. Nonagitating trucks may be used for transporting conventional central-mixed concrete over a smooth road when the hauling time is less than 15 minutes and the slump is less than 3 inches. Bodies of nonagitating trucks shall be smooth, water-tight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation.

3.3 Belt Conveyors: Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer or delivery truck to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means for preventing segregation of the concrete or loss of mortar at transfer points and the point of placing. The NMSA required in mixture proportions furnished by the Government will not be changed to accommodate the belt width.

3.4 Spreading and Remixing Equipment: The primary spreading procedure shall be accomplished by dozer. Graders or other equipment not specified may be used to facilitate the RCC spreading process only when approved. For open, unrestricted areas, the dozer shall be a minimum size and weight equivalent to a Caterpillar D-6. For restricted placement areas, such as placement of RCC near the dam crest or next to abutments, the dozer shall have as a minimum a size and weight equivalent to a Caterpillar D-4. There shall be a minimum of one operating dozer for each 200 cubic yards of RCC placed each hour. The dozers shall be equipped with well-maintained grousers. A front-end loader with operator shall be available to assist with deposition and spreading of RCC as needed in confined areas. The equipment shall be maintained in good operating condition. The equipment shall not leak or drip oil, grease, or other visible contaminants onto the RCC surface. All equipment used for spreading and remixing that leaves the surface of the structure for maintenance or repairs or, for any other reason, must be cleaned of all contaminants by an approved method before returning to the structure surface. Under no conditions shall a dozer or other tracked vehicle be operated on other than fresh uncompacted RCC except to facilitate startup operations for each lift and by approved procedures.

3.5 Compaction Equipment:

3.5.1 Self-propelled vibratory rollers shall be used for primary rolling and shall be double-drum. They shall transmit a dynamic impact to the surface through a smooth steel drum by means of revolving weights, eccentric shafts, or other equivalent methods. The compactor shall have a minimum gross mass of 20,000 pounds and shall produce a minimum dynamic force of 350 pounds per linear inch of drum width. The operating frequency shall be variable in the approximate range of 1,700 to 3,000 cycles per minute. The amplitude shall be adjustable between 0.015 and 0.04 inches. The roller shall be capable of full compaction in both forward and reverse directions. The roller shall be operated at speeds not exceeding 2.2 ft/s. Within the range of the operating capability of the equipment, the Contracting Officer may direct or approve variations to the frequency, amplitude, and speed of operation which result in the specified density at the fastest production rate.



3.5.2 Small vibratory rollers shall be used to compact the RCC where the larger vibratory rollers specified above cannot maneuver. The rollers shall compact the RCC to the required density and shall be so demonstrated during construction of the test section. Small vibratory rollers cannot compact the RCC to the same density and thickness as the primary rollers. When small rollers are used, total lift thickness of the RCC layer or lift shall be reduced to not over 6 inches uncompacted thickness to permit adequate compaction. Rollers shall have independent speed and vibration controls and shall be capable of a wide range of speed adjustments.

3.5.3 The tampers shall compact the RCC to the required density and shall be so demonstrated during construction of the test section. Tampers cannot compact the RCC to the same density and thickness as the primary rollers. When tampers are used, thickness of each RCC layer that is to be compacted shall be reduced to not more than 6 inches uncompacted thickness to assure adequate compaction.

3.6 Placing During Rain: RCC shall not be placed during rainfall of 0.1 inch/hr or more. During periods of lesser rainfall, placement of RCC may continue if, in the opinion of the Contracting Officer, no damage to the RCC is occurring. Work shall commence only after excess free surface water and contaminated paste or RCC have been removed. The surface shall have gained sufficient strength (no less than 4 hours after the RCC placement was suspended) to prevent rutting, pumping, intermixing of rainwater with the RCC, or other damage to the RCC. When the RCC surface has been contaminated or damaged in any manner, the RCC surface shall be washed to break up and remove laitance and/or mud-like coatings from the surface. Any undercut coarse aggregate shall be removed. All waste shall be removed and disposed of in an approved manner.

3.7 Hot-Weather Placement In hot-weather placement the temperature of the RCC shall be controlled so that it does not exceed 75.0 degrees F when placed. Placement shall be suspended as soon as the RCC temperature exceeds 75 degrees F. Measures that can be taken to prevent temperatures exceeding 75 degrees F include, but are not limited to; 1.) chilling mixing water, 2.) sprinkling aggregate stockpiles, 3.) use of a canopy to shade the RCC placement areas, 4.) placing during nighttime and early morning hours, or 5.) restricting placements to cloudy days. Use of any of these systems shall not be reason for extension of completion dates specified in these specifications. In addition, to prevent potential damage to the RCC due to hot-weather related placement conditions, all RCC operation shall be suspended between June 15th and October 31st.



SECTION 03405 PRECAST ARCHITECTURAL CONCRETE

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of precast architectural concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Precast unit design shall conform to ACI 318 / 318M / 318R and PCI Mnl-122. Design loads for precast concrete shall be as indicated on the drawings. A differential temperature of 160 degrees F, between interior and exterior faces of the units, shall be considered in the design. Stresses due to restrained volume change caused by shrinkage and temperature differential, handling, transportation and erection shall be accounted for in the design. Samples of each type of finish shall be provided.

2.2 Connections Connection of units to other members, or to other units shall be of the type and configuration indicated. The design and sizing of connections for all design loads shall be by the Contractor.

2.3 Concrete Strength Precast concrete units shall have a 28-day compressive strength of 5000 psi

2.4 Concrete Proportion Selection of proportions for concrete shall be based on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. The concrete proportion shall be developed using the same: 1.) type and brand of cement, 2.) the same type and gradation of aggregates, 3.) the same type and brand of admixture, that will be used in the manufacture of precast concrete units for the project. Calcium chloride shall not be used in precast concrete. Admixtures containing chloride ions, nitrates, or other substances that are corrosive shall not be used in prestressed concrete.

2.5 Reinforcing Steel: Reinforcing steel shall be galvanized if clearance to an exterior face is 1 inch or less.

2.6 Prestressing Strands: shall conform with ASTM A 416/A 416M

2.7 Inserts: shall be manufacturer's standard, suited for the application.

2.8 Plates, Angles, Anchors and Embedments: Material shall be as specified in PCI Mnl-117. Steel items, other than stainless, shall be coated with a rust-inhibiting paint or shall be hot-dip galvanized. Steel items, including items embedded in concrete, shall be either stainless steel or hot dip galvanized steel.

3.0 EXECUTION:

3.1 Erection: Precast units shall be erected in accordance with the detail drawings and without damage to other units or to adjacent members. Units shall be set true to alignment and level, with joints properly spaced and aligned both vertically and horizontally. Erection tolerances shall be in accordance with the requirements of PCI Mnl-117 and PCI Mnl-122. As units are being erected, shims and wedges shall be placed as required to maintain correct alignment. After final attachment, precast units shall be grouted as shown. After erection, welds and abraded surfaces of steel shall be cleaned and touched-up with a zinc-rich paint. Welds shall be made by a certified welder in accordance with the manufacturer's erection drawings. Pickup points, boxouts, inserts, and similar items shall be finished to match adjacent areas after erection. Erection of precast units shall



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be supervised and performed by workmen skilled in this type of work. Welding and the qualifications of welders shall be in accordance with AWS D1.1.

3.2 Cleaning: Not sooner than 72 hours erection, faces and other exposed surfaces of precast concrete discolored during erection shall be cleaned to remove dirt and stains by dry scrubbing with a stiff fiber brush, wetting the surface and vigorous scrubbing of the finish with a stiff fiber brush followed by additional washing, or by chemical cleaning compounds such as detergents or other commercial cleaners. Commercial cleaners shall be used in accordance with the manufacturer's recommendations. Cleaning procedure shall be performed on a designated test area and shall be approved prior to proceeding with cleaning work. Discolorations which cannot be removed by these procedures, will be considered defective work. Cleaning work shall be done when temperature and humidity permit surfaces to dry rapidly. Adjacent surfaces shall not be damaged during cleaning operations.



SECTION 03415 PRECAST-PRESTRESSED CONCRETE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast-prestressed concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Portland Cement: shall conform to ASTM C 150, Type I, II or III. The tricalcium aluminate content of the Type III cement shall be limited to 5 or 8 percent.

2.2 Blended Hydraulic Cement: shall conform to ASTM C 595.

2.3 Silica Fume: Silica fume may be furnished as a dry, densified material or as a slurry. Silica fume, unprocessed, or before processing into a slurry or a densified material, shall conform to the following requirements:

- a. Silicon dioxide content: 85-percent minimum, test method ASTM C 311.
- b. Loss on ignition: 6.0-percent maximum, test method ASTM C 311.
- c. Surface area, nitrogen adsorption, 15,000 m²/kg minimum, test method ASTM C 1069.
- d. Oversize, percent retained on 45-micrometer sieve: 5-percent maximum, test method ASTM C 430.

The Contractor shall provide at his expense the services of a manufacturer's technical representative, experienced in mixture proportioning, placement procedures, and curing of concrete containing silica fume. The manufacturer's representative shall be available for consultation by both the Contractor and the Government during mixture proportioning, planning, and production of silica-fume concrete. The rep shall be on site immediately prior to, and during at least the first placement of concrete containing silica fume and at other times, if directed.

2.4 Pozzolan: shall conform to ASTM C 618 Class F or C.

2.5 Aggregates: shall meet the requirements of ASTM C 33.

2.6 Admixtures: In no event shall admixtures containing chlorides or nitrates be used in the concrete.

2.6.1 Air-entraining admixture shall be certified to comply with ASTM C 260.

2.6.2 Water-reducing admixture shall be certified to comply with ASTM C 494 Type A.

2.6.3 Accelerating admixture shall be certified to comply with ASTM C 494 Type C.

2.7 Steel Reinforcement: Steel reinforcement shall be in accordance with Section 03205 Concrete Reinforcement.

2.8 Steel Tendons: Steel tendons shall be in accordance with Section 03230 Steel Stressing Tendons and Accessories for Prestressed Concrete.



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2.9 Concrete: Concrete shall be composed of cementitious material, water, fine and coarse aggregate, and admixtures. The cementitious material shall be portland or blended hydraulic cement and pozzolan where appropriate. The admixtures shall be an air-entraining agent, and may include a water-reducing admixture when its formulation and use are approved. Air Content shall be between 5 and 7 percent as determined in accordance with ASTM C 231. Proportions shall be selected so as to produce an average strength exceeding the design strength f'_c required. Where the production facility has a standard deviation record determined in accordance with ACI 214, based on 30 consecutive strength tests of similar mixture proportions to that proposed, obtained within 1 year of the time when concrete placing is expected, it shall be used in selecting average strength. The average strength used as the basis for selecting proportions shall exceed the specified strength f'_c by at least 5 percent.

2.10 Tolerances

2.10.1 The length of the member shall not deviate from the length shown in the contract drawings by more than plus or minus $3/4$ inch or plus or minus $1/8$ inch per 10 feet of length, whichever is greater.

2.10.2 The cross-sectional dimensions of a member shall, 1.) if less than 36 inches, shall not vary by more than plus or minus $1/4$ inch and, 2.) if over 36 inches, they shall not vary by more than plus or minus $3/8$ inch.

2.10.3 The horizontal alignment of the members shall not deviate from a straight line parallel to the theoretical centerline by more than $1/2$ inch or $1/8$ inch per 10 feet of length, whichever is greater. The maximum gap between two adjacent members due to sweep shall not exceed 1 inch.

2.10.4 The actual camber of beams shall not deviate from the computed camber by more than plus or minus $1/8$ inch per 10 feet but not more than plus or minus $1/2$ inch maximum total deviation.

2.10.4 The differential in camber at midspan between adjacent members shall not exceed $1/4$ inch per 10 feet of length or $3/4$ -inch maximum.

2.10.5 The position of the tendons shall not deviate from the design position by more than plus or minus $1/4$ inch.

3.0 EXECUTION:

3.1 Fabrication: Fabrication of precast-prestressed members shall follow the applicable provisions of the PCI Mnl-116s, except as specified herein.

3.1.1 All casting beds shall have concrete support on unyielding foundations.

3.1.2 Forms, both fixed and movable, shall be of steel. All forms and beds shall be thoroughly cleaned after each use.

3.1.3 Bulkheads, spacers, templates, and similar equipment having influence on the accuracy of dimensions and alignment shall be regularly inspected and maintained after each casting.

3.1.4 Accurate alignment of forms shall be maintained during the casting operation to assure compliances with tolerances specified. Leakage of the paste in form joints is not acceptable, and measures shall be taken to prevent such leakage. Measures shall also be taken to provide corner chamfers.

3.1.5 For exposed members, form ties, if used, shall be of the threaded or snap-off type so no parts will be left at the surface of the finished concrete.

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3.1.6 The tendons shall be placed, stressed, and destressed in accordance with Section 03230 Steel Stressing Tendons and Accessories for Prestressed Concrete.

3.1.7 Anchorages for posttensioning tendons will not interfere with the placement of the member such that adequate compaction of the concrete in the anchorage zone is impeded.

3.1.8 Steel bars and welded wire fabric shall be placed in accordance with Section 03205 Steel Reinforcement.

3.1.9 Concrete placement shall be in accordance with Section 03305 Cast In Place Concrete, except that once placement is started in a member it shall be carried on in a continuous operation until the member is completed. Members shall be cast in a horizontal position and casting in tiers will not be permitted. Adequate vibration shall be provided with internal and form vibrators so the cast members shall be free of rock pockets or surface blemishes resulting from inadequate vibration. Cold joints shall not be permitted in prestressed concrete members. If delays occur that result in hardening of the concrete so it will not receive a vibrator and again become plastic, the concrete shall be removed and the forms shall be washed out and refilled, otherwise partially cast members will be rejected.

3.2 Curing and Protection Concrete for the manufacturing of the precast-prestressed concrete members shall be cured and protected in accordance with Section 03305 Cast In Place Concrete or by other methods further specified here.

3.2.1 Curing with Steam at Atmospheric Pressure; Steam curing shall be under a suitable enclosure to retain the live steam to minimize moisture and heat losses. The enclosure shall allow free circulation of the steam around the sides and top of the beams. Steam jets shall be so positioned so they do not discharge directly on the concrete, forms, or test cylinders. The cycle of steam application shall conform to the following:

3.2.2 Curing After Placing and Vibrating; After placing and vibrating, the concrete shall be allowed to attain its initial set before the steam is applied. During the period between placement of the concrete and application of steam, provisions shall be made to prevent surface drying by means of a coating of membrane curing compound, moist covers, or equally effective methods. Application of the steam shall be delayed not less than 2 hours and not more than 10 hours after the time of concrete placement. If the ambient temperature is below 50 degrees F, enough heat shall be applied to maintain the concrete at its placing temperature.

3.2.3 Temperature Increase The ambient temperature within the casting enclosure shall be increased at a rate not to exceed 40 degrees F per hour. Temperature increase shall be as uniform as possible.

3.2.4 Temperature Range The temperature shall be increased until the ambient temperature in the casting enclosure is between 140 and 160 degrees F. Once this temperature range is reached, it shall be maintained until the concrete has reached the compressive strength necessary for stressing or destressing the tendons.

3.2.5 Temperature Decrease In discontinuing the steam curing, the ambient air temperature shall decrease at a rate not to exceed 40 degrees F per hour. Temperature decrease shall be as uniform as possible.

3.2.6 Recording Thermometers Recording thermometers showing the time-temperature relationship through the curing period from placing concrete to transfer of prestress shall be provided. At least one recording thermometer per casting enclosure shall be used. The desired curing time-temperature relationship shall be placed on the recording chart of the recording thermometer to aid the personnel controlling the temperature during curing. Recording charts shall be made available upon request and shall be clearly visible during the curing process.



3.2.7 Radiant Heat Radiant heat may be applied to beds by means of pipe circulating steam, hot oil, or hot water or by electric blankets or heating elements on forms. Pipes, blankets, or elements shall not be in contact with concrete, form surface, or test cylinders.

3.2.8 Moisture Loss During the cycle of radiant heat curing, effective means shall be provided to prevent rapid loss of moisture in any part of the member. Moisture may be applied by a covering of moist burlap or cotton matting. Moisture may be retained by covering the member with a plastic sheet in combination with an insulating cover or by applying a liquid seal coat or membrane curing compound.

3.2.9 Temperature Limits Temperature limits and use of recording thermometer shall be as specified for curing with steam at atmospheric pressure.

3.2.10 Termination of Curing Termination of curing shall be as specified in Section 03305 Cast-In-Place Concrete unless the concrete has been cured by one of the two methods stated above. Termination of curing for concrete cured by either the steam at atmospheric pressure method or the radiant heat with moisture shall be determined based on the compressive strength of the concrete necessary for stressing or destressing the tendons.

3.3 Erection:

3.3.1 Seating of Precast Prestressed Concrete Members The precast prestressed concrete members shall be set into place in a manner which assures full bearing. If the bearing called for in the contract drawing is not obtained, then the members shall be removed and the situation corrected.

3.3.2 Roof and Floor Roof and floor single or double T-beams shall be erected in an increasing or decreasing magnitude of camber to minimize differential between beams. The contractor shall measure T-beam camber and number the beams prior to erection.

3.3.3 When welding or burning with a welding electrode, the ground shall be attached directly to the base metal. Under no circumstances shall the member be used as a conductor for the ground.

3.3.4 Erection Plan The erection plan shall be in sufficient detail so that adequacy of equipment, techniques, and accessories can be determined and comments offered. Acceptance of the Contractor's erection plan shall not relieve the Contractor of his responsibility for erecting precast prestressed members into position as required by the plans and specifications.

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SECTION 03425 MISCELLANEOUS PRECAST ITEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous precast items. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Precast Items: shall include, but not be limited to, stairs, sun screens, trellis, planters, handrails, splash blocks, and bumper curbs and shall be supplied by a manufacturer normally engaged in the fabrication of these items.

2.2 Fabrication: PCI MNL-117.

2.3 Each Unit shall be complete and self-contained.

2.4 Items shall be fabricated from concrete with a minimum strength of 3,000 psi and shall be reinforced as required to withstand both construction loads and design loads.

2.5 Stairs shall be supplied in complete runs.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Provide Anchors, Devices, and Openings required to install precast units.

3.1.2 Precast Units shall be hoisted at points provided by the manufacturer and in a manner that avoids damage to the units.

3.1.3 Temporarily Brace Precast Units in proper position and alignment until permanent anchorage and supports are in place.

3.2 Erection:

3.2.1 Anchor Units in final position by bolting, welding, grouting, or as otherwise directed. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed.

3.2.1.1 At Bolted Connections use lock washers or other acceptable means to prevent loosening of nuts.

3.2.1.2 At Welded Connections, apply rust-inhibitive coating on damaged areas, identical to shop-applied material. Use galvanizing repair coating on galvanized surfaces.

3.2.2 Cleaning: Clean exposed facings to remove dirt and stains that may be on units after erection and completion of joint treatments. Do not use cleaning materials or processes that could change the character of exposed concrete finishes.



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SECTION 03505 PRECAST LIGHTWEIGHT ROOF SLABS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast lightweight roof deck concrete channels, concrete planks, and gypsum planks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Channel Slabs: Slabs shall be composed of Portland cement and lightweight aggregate with minimum compressive strength 3,750 psi. Legs shall be reinforced with deformed bars; web shall have welded wire fabric reinforcement. Channels shall support a 30 psf live load plus a 20 psf superimposed dead load. Deflection shall not exceed $L/240$ of span.

2.2 Planks: Planks shall be composed of Portland cement and lightweight aggregate with a minimum compressive strength of 3,750 psi. Planks shall be reinforced with welded wire fabric. Planks shall support a 30 psf live load plus a 20 psf superimposed dead load. Deflection shall not exceed $L/240$ of span. Metal edge members, if furnished with units, shall be galvanized or galvanized and factory painted.

2.3 Gypsum Planks shall be suitable for the intended use, factory-laminated to 2-inch thickness, 2-foot wide panels. Planks shall be continuously supported along sides.

2.4 Subpurlins shall be bulb-tees, hot-rolled from high-strength rail steel, ASTM A 499.

2.5 Grout shall be lightweight concrete or gypsum concrete.

2.6 Nailable: Concrete slabs shall be capable of accepting roofing nails without shattering or spalling. Nonnailable concrete slabs shall be either cellular or aggregate concrete, flat or channel in shape.

2.7 Joint Material: Joint material shall be high-melting-point asphaltic mastic, grout, mortar, or lightweight concrete. Joints at hips and ridges may be filled with wood blocking, single thickness, structural grade, pressure-preservative treated.

3.0 EXECUTION:

3.1 Concrete Channels and Planks shall be securely attached to support steel or concrete by metal clips or other approved attachments; minimum support bearing shall be 4 inches. Open joints between channels or planks shall be filled. Planks with tongue and groove edges may not require grouting. Field-cut openings for utilities penetrations shall be accomplished in accordance with the manufacturer's recommendations. Roof deck shall be straight and true, and when laid in place must present a flat, level surface suitable for application of roofing.

3.2 Gypsum Planks shall be snugly fitted between bulb-tee subpurlins. Subpurlins shall be tack-welded or screw-attached to supporting steel or weld bar cast in supporting concrete. Joints at bulb-tees shall be grouted with gypsum grout.



SECTION 03510 GYPSUM CONCRETE DECKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum concrete decks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Gypsum Concrete: ASTM C 317, Class A, 500 psi compressive strength.

2.2 Formboards:

2.2.1 Sheetrock: ASTM C 36, Type X, 5/8 inch by 24 inches by required length.

2.2.2 Mineral Fiber Board: ASTM C 612.

2.2.3 Cement Fiber Board: ASTM E 1264, Type IX, Fire Class A.

2.2.4 Glass Fiber Board: Lightweight, rigid, composed of pressed glass fibers.

2.3 Bulb Tees: Hot-rolled from high-strength rail steel, ASTM A 499. Flanges shall provide 5/8 inch minimum bearing for gypsum deck panels. Tees shall be galvanized or factory coated with manufacturer's standard primer.

2.4 Reinforcing Mesh:

2.4.1 Welded Wire Fabric: ASTM A 185, galvanized, 12 x 48-W 0.5 x W 0.5.

2.4.2 Woven Wire Fabric: ASTM A 82, galvanized, 19 gauge wire, 2-inch hexagonal mesh.

2.5 Gypsum deck plank: Planks shall be 2 inch or 2-5/8 inch nominal thickness, 24 inches wide, and the required length. Planks shall be long enough to span two main purlin spans where possible. Planks shall be provided with offset edges encased in water-resistant paper in accordance with ASTM C 442.

3.0 EXECUTION:

3.1 Support System: Sub-purlins shall be spaced to support formboard and rigidly attached to main supports. Formboards shall fit snugly at sub-purlins and at wall, curbs, and openings.

3.2 Reinforcement: Lay wire fabric continuously over subpurlins. Do not lap side of reinforcement.

3.3 Gypsum Concrete: Gypsum concrete shall be placed continuously without interruption until entire panel or section is complete. Immediately after placement, screed, level, and trowel smooth.

3.4 Fire Rated Decks: For fire rated decks gypsum deck panels shall be placed on bottom flanges of subpurlins. Gypsum deck planks shall be placed over gypsum deck panels in accordance with manufacturer's directions for fire rated system. Planks shall be placed with offset edges "up" to form a "T" receptacle for gypsum concrete.

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3.5 Protection: The installed decking units shall be protected from damage by weather and construction operations. The complete decking shall be kept clean and free of damaged or defaced units, and left ready to receive painting. Surfaces to be painted shall be dry and free of grease and oil. The top surface shall receive a paint sealer; traffic areas shall receive a second coat of floor paint.



SECTION 03520 INSULATING CONCRETE ROOF DECKS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of insulating concrete roof decks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:** Lightweight Concrete Roof Insulation, low density concrete approx. 50lb/cu.ft placed with or without rigid insulation.

2.1 **Portland Cement:** ASTM C 150, Type I or III.

2.2 **Aggregate:** ASTM C 332, Type I, perlite or vermiculite. Containing no detectable asbestos as determined in 40 CFR 763, subpart E, Appendix E, Section 1.

2.3 **Water:** Clean, potable.

2.4 **Admixture:** Air-entraining, ASTM C 260.

2.5 **Reinforcement:** Welded wire fabric, ASTM A 185, galvanized, 12 x 48 - W 0.5 x W 0.5.

2.6 **Air Producing Foaming Agents:** In lieu of aggregate above, use cellular lightweight concrete standard manufacturer's products, ASTM C 260, with minimum compressive strength of 200 psi.

2.7 **Molded-Polystyrene Insulation Board:** ASTM C 578, Type I, 0.90-lb/cu. Ft. minimum density with 3 percent of area as keying slots.

2.8 **Fly Ash:** Use of fly ash, ASTM C 618, Class C or F, is not to exceed 25 percent of portland cement by weight.

3.0 EXECUTION:

3.1 **Reinforcing Mesh:** Place reinforcing mesh at right angles to structural supports, with end laps at least 6 inches and no side laps. Cut to fit around roof openings and projections. Terminate mesh at control joints.

3.2 **Place Lightweight Insulating Concrete:** using equipment and procedures to avoid segregation of mix and loss of air content. Deposit and screed lightweight concrete roof insulation in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Leave top surface smooth, free of ridges and depressions in acceptable condition to receive subsequent roofing application. Do not place concrete roof insulation unless ambient temperature is 40 degrees F and rising. Do not place concrete roof insulation in rain or snow conditions.

3.3 **Begin Curing Operations** immediately after placement, and air cure for not less than 3 days. Prevent from freezing for 72 hours after placement.



SECTION 03530 CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious wood fiberboard and tees for roof decks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cementitious Wood Fiber Planks Structural Cement-Fiber Roof Decking Structural cement-fiber roof decking shall be shaped under pressure to required dimensions from a mixture of wood fibers and cementitious materials in proportions to produce deck units meeting the loading conditions specified. Exterior surfaces shall be suitable for applying roof. Metal edge members, if furnished with units, shall be galvanized. Flame spread shall not exceed 25 and smoke developed rating shall not exceed 50 when tested in accordance with ASTM E 84. Linear variation with change in moisture content, both linear and transverse, shall not be more than 0.2 percent when tested in accordance with ASTM D 1037. Plank edges shall be either tongue and groove or rabbeted to receive bulb-tee subpurlins.

2.2 Bulb-Tees: Hot-rolled from high-strength rail steel, ASTM A 499.

2.3 Grout: Lightweight concrete.

3.0 EXECUTION:

3.1 Subpurlin System: Planks shall be fitted between bulb-tees. Bulb-tees shall be securely fastened to supporting members. Spaces between planks at subpurlins shall be filled with lightweight concrete grout. Systems of planks and subpurlins shall support a 30 psf live load and a 10 psf superimposed dead load.

3.2 Tongue and Groove System: Planks shall be erected directly on supporting members and securely attached with metal clips or other approved fasteners. The tongue and groove of both ends and sides of plank shall be snugly fitted to eliminate open cracks.

3.3 Installation: Field-cut openings for utilities penetrations shall be accomplished in accordance with the manufacturer's recommendations. Roof deck shall be straight and true, and when laid in place must present a flat, level surface suitable for application of roofing. All roof decking units shall bear on at least two structural framing members with a 1 inch minimum bearing. Any cantilever plank shall not exceed the design span. Installation shall require a minimum of cutting. Cutting, where required, shall be at a true angle to the top of the unit. All units shall be made to fit around openings and projections, valleys, walls, and curbs, so that cut ends occur on supports and in a manner that will not damage the units. When roof deck units are welded to steel supports, welds and damaged galvanized coatings shall be cleaned and coated with zinc-rich paint. No attachment for carrying loads shall be made directly to the roof decking or subpurlins.



SECTION 03705 CONCRETE RESTORATION AND CLEANING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of concrete. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Epoxy Resin: Two-part epoxy adhesive containing 100 percent solids.

2.1.1 Bond Strength: ASTM C 882, 2,700 psi.

2.1.2 Tensile Strength: ASTM D 638, 6,600 psi.

2.1.3 Elongation: ASTM D 638, two percent.

2.1.4 Flexural Strength: ASTM D 790, 8,000 psi.

2.1.5 Compressive Strength: ASTM D 695, 10,000 psi.

2.2 Bonding Agent: Polyvinyl acetate emulsion, water-resistant when applied and cured.

2.3 Concrete: The concrete mixture shall match that of the existing concrete to be repaired unless otherwise directed and shall be designed in accordance with ACI 211.1 and ACI 211.2. The mixture proportions shall include consideration of the finishes required.

2.3.1 Portland Cement: ASTM C 150.

2.3.2 Sand: ASTM C 33.

2.3.3 Coarse Aggregate: ASTM C 33.

2.3.4 Water: Clean and potable.

2.3.5 Air-Entraining Admixture: ASTM C 260.

2.3.6 Water-Reducing and Retarding Admixture: ASTM C 494.

2.3.7 Bonding agents for use in bonding concrete and mortar patching materials to concrete and steel are specifically prohibited for use in the work.

2.4 Cleaning Agent: Commercial muriatic acid, mixed one part to ten parts potable water.

2.5 Reinforcing Steel: ASTM A 615, Grade 40 or 60.

3.0 EXECUTION:

3.1 Cleaning:

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3.1.1 Clean Concrete Surfaces of dirt, laitance, corrosion, oil, stains, or other contamination. Surface cleaning shall be accomplished by one or more of the following methods as appropriate for the contamination: 1.) wire brush using plain water or acid, 2.) sandblasting (only when subsurface), 3.) high pressure steam cleaning with or without chemical additives, 4.) high pressure water, 5.) high pressure air, or 6.) scrub brush and detergent. When acids or chemicals are used, surface shall be thoroughly rinsed and neutralized. Sandblasting equipment shall not be used in cleaning concrete and other building surfaces; and shall be subject to approval for each other specific applications such as cleaning reinforcing steel.

3.1.2 Deteriorated or Spalled Concrete:

3.1.2.1 Completely Remove all loose, deteriorated, or unsound concrete down to sound concrete.

3.1.2.2 Where Removal Exceeds 1/4 inch or where resurfacing of the entire area is not anticipated, concrete shall be removed to a minimum depth of 2 inches. If cover for reinforcing bars is 2 inches or less, remove concrete to completely expose the reinforcing in the repair area. Remove concrete to a minimum of 1-1/2-inches clear beyond reinforcing. Edges of the repair area shall be cut sharp, perpendicular to the face of the concrete surface, and at least 1 inch deep. Make the perimeter cut with a concrete saw and in a manner to not cut the reinforcing. Clean reinforcing of all rust and scale. Clean repair area of all loose or foreign material using high pressure air or water.

3.2 Resurfacing:

3.2.1 Resurfacing for concrete floors shall be with either epoxy coating or cementitious materials.

3.2.1.1 Epoxy Resurfacing shall be applied to a clean hard surface to a minimum thickness of 1/8 inch.

3.2.1.2 Cementitious Material Resurfacing shall be a minimum of 1 inch thick. Mix shall be one part Portland cement, one part sand, and 1-1/2 parts coarse gravel not exceeding 3/8-inch size crushed rock. Apply bonding compound and immediately place new surfacing. Curing shall be by burlap blanket method. Blankets shall be kept thoroughly saturated and in intimate contact with the concrete.

3.2.2 Resurfacing of Columns: Resurfacing of spalled or deteriorated column surfaces shall be with epoxy grout prepared with the addition of sand to epoxy resin to obtain a mix consistency that will not sag when placed in thin layers on vertical surfaces. Trowel finish.

3.3 Concrete Rehabilitation:

3.3.1 Concrete Patching:

3.3.1.1 Surface Shall Be Prepared as specified for deteriorated concrete cleaning.

3.3.1.2 Any Existing Reinforcing Bars that have a loss of more than 25 percent of their cross section through corrosion shall be replaced. Clean reinforcing bars by sandblasting or wire brushing.

3.3.1.3 Patch with Portland Cement Concrete if average patch thickness is 2 inches or greater; if less than 2 inches, patch with epoxy grout. Use bonding compound when placing Portland cement concrete patch.

3.3.2 Crack Repair:



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3.3.2.1 Epoxy Resin Adhesive Injection: Provide temporary surface seal on crack with entry ports spaced equal to the approximate thickness of the concrete. Inject adhesive into ports under pressure. Continue from port to port until crack is filled, working from bottom to top. Remove temporary seal and clean surface.

3.3.2.2 Epoxy Grout: The crack shall be cut out at the surface in a V-shape that extends to approximately 2 to 3 inches in width. Thoroughly blow out crack with high pressure air and wet with clean water. Completely fill the crack beyond the V-shaped portion with epoxy grout. The mix shall be thin enough to run freely into the crack for horizontal surfaces. Vertical cracks shall require a stiff mix tamped into place to fill all voids. Trowel finish.

3.4 Weather Restrictions for normal weight concrete shall be observed with special attention to both cold and hot weather concrete procedures.



SECTION 03730 CONCRETE TOPPING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete floor toppings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cement: Portland cement, ASTM C 150, Type I or III.

2.2 Sand: ASTM C 33.

2.3 Coarse Aggregate: ASTM C 33, maximum size 3/8 inch.

2.4 Granolithic Material: Bonded Topping for Heavy Duty Floors: Coarse aggregate used for this purpose shall be a well graded, hard mineral, non-staining, sound diabase, trap rock, emery, granite or other natural or manufactured aggregate. Topping material shall have equivalent hardness and wearing qualities and shall have a percentage of loss not to exceed 30 after 500 revolutions when tested in accordance with ASTM C 131.

2.5 Mineral-Aggregate Topping: Material shall be factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide. Mixture shall be not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at project site. Compressive strength shall be 7000psi at 28 days and shall comply with ASTM C109/C 109M.

2.6 Iron-Aggregate Topping shall be factory prepared and dry-packaged mixture of graded iron aggregate, portland cement, plasticizers, and other admixtures to which only water needs to be added at project site. Compressive strength shall be 10,000psi at 28 days and shall comply with ASTM C109/C 109M.

3.0 EXECUTION:

3.1 Integral Topping: Topping shall be a one part cement, one part sand, and two parts aggregate mix to produce a hard topping with a minimum 28-day compressive strength of 5,000 psi.

3.1.1 Surface of Base Slab shall be roughened before placing topping.

3.1.2 Spread Topping Mixture evenly over base, bring to required depth, and strike off level with a straightedge. Consolidate surface by power-float finishing.

3.1.3 Hard-Trowel-Finish slab topping.

3.1.4 Control Joints in Topping shall be located directly above joints in base slab.

3.2 Granolithic Finish: Topping shall be a one part cement, one part sand, and 1-1/2 parts aggregate mix. Topping shall be placed same as integral topping.



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3.2.1 Prior to Final Troweling, granolithic material shall be spread evenly over the topping surface.

3.2.2 Granules shall be worked into the surface to provide complete bonding with the topping but also to provide an abrasion-resistant, non-skid surface.

3.2.3 Mineral and Iron aggregate topping materials shall be applied using manufacturers directions.

3.3 Curing: An evaporation retarding film membrane curing compound per ASTM C 309, Type 1, absorptive cover or moisture retaining cover shall be employed as recommended by manufacturer. Traffic shall be restricted from the area of completed topping for recommended curing duration.

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DIVISION 04 MASONRY



SECTION 04190 SCAFFOLDING - TUBULAR STEEL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tubular steel scaffolding. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Tubular steel or aluminum scaffolding system shall comply with OSHA Safety and Health Standards, Section 29 CFR, 1926/1910.

3.0 EXECUTION: (Section not used.)



SECTION 04202 UNIT MASONRY

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of facing brick, concrete block, glazed concrete unit masonry, sound-absorbing unit masonry, clay wall tile, sound-absorbing structural glazed tile, glass unit masonry, and vitrified clay flue liners. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Facing Brick:

2.1.1 Facing Brick Units shall be of standard size, texture, and color and shall conform to ASTM C 216, Grade SW and ASTM C 67.

2.1.2 Glazed Brick Units shall be of standard size and color and shall conform to ASTM C 216, Grade SW and ASTM C 126.

2.2 Concrete Block:

2.2.1 Solid Load-Bearing Concrete Block: ASTM C 145.

2.2.2 Hollow Load-Bearing Concrete Block: ASTM C 90.

2.2.3 Nonload-Bearing Concrete Block: ASTM C 129, Type I.

2.2.4 Patterned Concrete Block: Compatible with existing in dimension and appearance.

2.3 Glazed Concrete Unit Masonry:

2.3.1 Factory-Applied, Pre-Faced, Concrete Masonry Units shall be of standard shapes and sizes conforming to ASTM C 90, Grade N or Type I.

2.3.2 Facing Components shall conform to ASTM C 744.

2.3.3 Units shall be smooth and colored with satin gloss finish.

2.4 Sound-Absorbing Unit Masonry:

2.4.1 Sound-Absorbing Masonry Units shall be of standard shapes and sizes conforming to ASTM C 90 or ASTM C 129, as applicable.

2.4.2 Slots in the Masonry Unit Cavities shall be narrow slots in empty cavities or wide slots with fibrous fillers in cavities, as. Spec. SS-C-1960/1 and consisting of water-repellant stearates and pozzolanic applicable, for desired sound transmission absorption.

2.4.3 Pre-finished Units shall have ground-face or glazed surface.



2.5 Clay Wall Tile:

2.5.1 Load-Bearing Wall Tile hollow units shall be of standard shapes and sizes conforming to ASTM C 34, Grade LB or LBX.

2.5.2 Non-load-Bearing Wall Tile shall be of standard shapes and sizes conforming to ASTM C 56, Grade NB.

2.5.3 Clay Wall Tile Color shall conform to ASTM C 212 or ASTM C 126.

2.5.4 Plaster Base Finish shall conform to ASTM C 34 and ASTM C 56.

2.6 Sound-Absorbing Structural Glazed Tile: Sound-absorbing tile units shall be of standard shapes and sizes conforming to ASTM C 212 or ASTM C 126. The required Sound Transmission Class (STC) shall be in accordance with ASTM E 90.

2.7 Glass Unit Masonry:

2.7.1 Glass Block Hollow Units shall be classified for 3/4 hour of fire exposure in accordance with UL Fire Exposure Classification 9 (UL-9): "Fire Test for Window Assemblies."

2.7.2 Insulation R-Values for the following unit face sizes shall be: 6 inches by 6 inches equals R-2; 8 inches by 8 inches equals R-1.96; and 12 inches by 12 inches equals R-1.92.

2.7.3 Unit Face Pattern shall be of a standard design to provide desired light transmission, brightness, and privacy.

2.7.4 Mortar shall be Type S in accordance with ANSI A41.1, ASTM C 1329 and ASTM C 270.

2.8 Refractories: Vitrified clay flue lining shall be rectangular, round, or modular, of standard sizes, and shall conform to ASTM C 315.

2.9 Mortar Materials and Mixing:

2.9.1 Hydrated Lime: ASTM C 207, Type S or N.

2.9.2 Admixtures: Generally not recommended for use. However, cold weather admixture shall comply with ASTM C 494, Type C and liquid water repellent admixture shall be compatible with mortar manufacturer.

2.9.3 Portland Cement shall comply with ASTM C 150, Type I or II. Masonry cement shall comply with ASTM C 91.

2.9.4 Coarse Aggregate for Masonry Grout shall comply with ASTM C 404. Do not use aggregate containing any substance that will stain masonry.

2.9.5 Sand shall comply with ASTM C 144 or ASTM C 33, paragraph 3.1.

2.9.6 Mortar shall comply with ASTM C 270 and ASTM 1329, and in the proportions, measured in parts by volume, as required for the application.

2.10 Masonry Accessories:

2.10.1 Reinforcement Bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 60.

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2.10.2 Joint Reinforcement shall be mill or hot-dipped galvanized carbon-steel wire or stainless-steel for exterior walls complying with ASTM A 951. Side rods and truss rods shall be W1.7 or W2.8 diameter.

2.10.3 Wire-Mesh Ties and Anchors shall be mill (ASTM A 641 Class 1 coating) or hot-dipped (ASTM A 153 Class B-2 coating) galvanized carbon-steel complying with ASTM A 82. Stainless-steel wire shall comply with ASTM A 580, Type 304 or 316.

2.10.4 Galvanized Steel Sheets shall comply with ASTM A 653/A 653M, G60 (Z180) and Stainless Steel Sheets shall comply with ASTM A 666, Type 304 or 316.

2.10.5 Rigid Steel Anchors shall be a minimum of 1-1/2 inch x 1/4 inch x 24 inches long with each end turned up not less than 2 inches or with cross-pins. Anchors shall be hot-dipped galvanized complying with ASTM A 153.

2.10.6 Seals and Gaskets for Control and Expansion Joint shall be preformed filler strips complying with ASTM D 1056, Grade 2A1, and preformed control joint gaskets complying with ASTM D 2000, Designation M2AA-805 and ASTM D 2287, Type PVC-65406.

2.11 Water-Repellent Materials for Concrete Block shall be solvent type silicone complying with ASTM C 920; transparent, non-staining, 5 percent silicone resin.

2.12 Patterned, Decorative Screen Units shall conform to the applicable requirements of ASTM C 90 or ASTM C 129. Units shall have uniform through-the-wall pattern, color, and texture.

3.0 EXECUTION:

3.1 Water Repellent Application shall be spray or brush in a single coat, using not less than one gallon for each 80 square feet covered. A flood coating with a rundown of material on the surface of from 6 inches to one foot shall be produced.

3.2 Window sills and coping shall be set in a full bed of mortar with faces plumb and true.



SECTION 04210 BRICKWORK

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brickwork. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Face Brick: Compatible with existing in mechanical characteristics, permeability, and appearance and shall comply with ASTM C 216 and ASTM C 67.

2.2 Common Brick: Compatible with existing in mechanical characteristics, permeability, and appearance and shall comply with ASTM C 62.

2.3 Concrete Brick: ASTM C 55.

2.4 Mortar Materials and Mixing:

2.4.1 Hydrated Lime: ASTM C 207, Type S or N.

2.4.2 Admixtures: Generally not recommended for use. However, cold weather admixture shall comply with ASTM C 494, Type C and liquid water repellent admixture shall be compatible with mortar manufacturer.

2.4.3 Portland Cement shall comply with ASTM C 150, Type I or II. Masonry cement shall comply with ASTM C 91.

2.4.4 Coarse Aggregate for Masonry-Grout shall comply with ASTM C 404. Do not use aggregate containing any substance that will stain masonry.

2.4.5 Sand shall comply with ASTM C 144.

2.4.6 Colored Masonry Cement shall be a factory formulated mixture complying with ASTM C 979. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.

2.4.7 Mortar shall comply with ASTM C 270 and ASTM 1329, and in the proportions, measured in parts by volume, as required for the application.

2.5 Masonry Accessories:

2.5.1 Reinforcement Bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 60.

2.5.2 Joint Reinforcement shall be mill or hot-dipped galvanized carbon-steel wire or stainless-steel for exterior walls complying with ASTM A 951. Side rods and truss rods shall be W1.7 or W2.8 diameter.

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2.5.3 Wire-Mesh Ties and Anchors shall be mill (ASTM A 641 Class 1 coating) or hot-dipped (ASTM A 153 Class B-2 coating) galvanized carbon-steel complying with ASTM A 82. Stainless-steel wire shall comply with ASTM A 580, Type 304 or 316.

2.5.4 Galvanized Steel Sheets shall comply with ASTM A 653/A 653M, G60 (Z180) and Stainless Steel Sheets shall comply with ASTM A 666, Type 304 or 316.

2.5.5 Rigid Steel Anchors shall be a minimum of 1-1/2 inch x 1/4 inch x 24 inches long with each end turned up not less than 2 inches or with cross-pins. Anchors shall be hot-dipped galvanized complying with ASTM A 153.

2.5.6 Cotton or Polyester Rope for weep holes shall be 1/4 to 3/8 inch diameter in length required to produce 2 inch exposure on exterior and 18 inches in cavity between wythes.

2.5.7 Wire Brick Ties shall be fabricated from 3/16 or 1/4-inch diameter hot-dipped galvanized or stainless-steel wire (mill galvanized wire ties may be used in exterior walls where humidity does not exceed 75 percent). Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

2.6 Flashing:

2.6.1 Through-Wall Flashing shall be one of the following:

2.6.1.1 Five-Ounce Copper Sheet shall comply with ASTM B 370, cold-rolled temper, coated both sides with a factory-applied elastic asphalt compound complying with ASTM D 449.

2.6.1.2 Ten-Ounce Rib-Formed Copper Sheet shall comply with ASTM B 370, cold-rolled temper, with ribs approximately 3/16-inch high and spaced not more than 3 inches apart.

2.6.1.3 Rib-Formed 32-Gauge, Type 302 or 304 Stainless Steel Sheet shall comply with ASTM A 167. Deformations shall be approximately 3/16 inch high and shall be spaced not more than 3 inches apart.

2.6.2 Flashing beneath coping stone shall be one of the following:

2.6.2.1 Stainless Steel Sheet shall comply with ASTM A 167, Type 302 or 304, finish No. 2P, dull, 26-gauge.

2.6.2.2 Copper Sheet shall comply with ASTM B 370, cold-rolled temper, 16-ounce per square foot.

2.6.2.3 Aluminum-Sheet shall comply with ASTM B 209, alloy 3003, temper H-14, .032 inch thick.

2.6.2.4 Galvanized Steel Sheet, 26-gauge, shall comply with ASTM A 527, and coating shall comply with ASTM A 525, designation G90.

2.7 Caulking and Sealants shall comply with ASTM C 920.

2.7.1 Backup Material for sealants shall be closed-cell resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oilless dry jute, or rope yarn.

2.7.2 Bond Preventative Material shall be pressure sensitive polyethylene tape, aluminum foil, or wax paper.



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2.8 Water-Repellent Materials for Facing Brick Masonry shall be solvent type silicone complying with ASTM C 920; transparent, non-staining, 5 percent silicone resin.

2.9 Dovetail Anchors shall be standard twelve gage complying with ASTM A 924 for mill galvanized, ASTM A 153 for hot-dipped galvanized or ASTM A 167 for stainless steel.

2.10 Wire Mesh Wall Ties shall be 16 gage hot-dipped galvanized complying with ASTM A 641.

3.0 EXECUTION:

3.1 Brick shall be laid with completely filled mortar joints in line with and of equal width to existing jointing.

3.2 1/4 to 3/8-inch Cotton or Polyester Weep Rope, 24 inches apart, shall be provided in the head mortar in the first course above the top of steel lintels, shelf angles, and ledge supports and where flashings and waterproofing terminate in horizontal joints.

3.3 Water Repellent Application shall be spray or brush in a single coat, using not less than one gallon for each 100 square feet covered. A flood coating with a rundown of material on the surface of from 6 inches to one foot shall be produced.

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SECTION 04250 TERRA COTTA

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of terra cotta. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Terra Cotta: Hard-burned, nonload-bearing clay building units.

2.2 Material for Setting Terra Cotta:

2.2.1 Cement shall be Portland cement complying with ASTM C 150, Type I, Type IA or Type II.

2.2.2 Sand for Mortar shall comply with ASTM C 144 and be tested in compliance with ASTM C 40 and C 117. Sand shall have a fineness modulus between 2.0 and 2.5.

2.2.3 Lime shall comply with ASTM C 5.

2.2.4 Hydrated Lime, if allowed, shall comply with ASTM C 207, Type S.

2.3 Mortar for the resetting of terra cotta shall be composed of one part Portland cement, 3 1/2 parts sand, and 1/2 part lime putty by volume.

3.0 EXECUTION:

3.1 Restoration of Terra Cotta Surface:

3.1.1 Remove All Loose Chips or flaking pieces from the surface. Cut mortar out of all joints to a depth of 3/8 inch from the face of the terra cotta.

3.1.2 Build Up Voids and Irregularities in the surface using successive coats of an epoxy caulk consisting of a 2-component 100 percent flexible-cured, thixotropic epoxy suitable for vertical surfaces.

3.1.3 Give All Patched Surfaces of the terra cotta two coats of an epoxy glaze consisting of 2-component, 100 percent epoxy, high-solids content, flexible cured, interior-exterior, high-gloss glaze.

3.2 Replacement of Terra Cotta:

3.2.1 Terra Cotta Units required to be replaced shall be carefully removed to avoid disturbing adjacent units.

3.2.2 Set Replacement Units plumb, level, true to line, and in a manner to match existing terra cotta.

3.3 Sealing Terra Cotta Joints:

3.3.1 Remove Joint Material to a depth of 3/8 inch or to the depth of sound material.



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3.3.2 Clean the Joints thoroughly.

3.3.3 RegROUT Joints and tool surface to match appearance of adjacent floor.

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SECTION 04405 STONework

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stonework. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Indiana Limestone: ASTM C 568, Category II.

2.2 Marble: ASTM C 503.

2.3 Building Sandstone: Compatible with existing.

2.4 Structural Granite: ASTM C 615.

2.5 Quartz-Based Dimension Stone Standard: ASTM C 616

2.6 Masonry Accessories:

2.6.1 Fastenings for Stone: Furnish and install all anchors, dowels, clamps, clips, bolts, and other attachments necessary to fasten and anchor stone in place. Steel wire shall be galvanized carbon-steel complying with ASTM A 82, with ASTM A 153 Class B-2 coating. Stainless steel shall be used to fabricate the sizes, shapes, and types of all anchoring and fastenings, except wire.

2.6.2 Slots for Dovetail Anchors shall be of 24-gauge commercial galvanized sheet metal, formed to give double anchorage for shoulder to forms.

2.6.3 Dovetail Anchors for fastening masonry to concrete shall be compatible with anchor slots.

2.6.4 Clay or shale brick veneer shall comply with ASTM C 216, concrete masonry unit veneer with ASTM C 90, and prefaced concrete masonry unit veneer with ASTM C 744.

2.7 Epoxy Mortar Patching Materials:

2.7.1 Epoxy Adhesive shall be a two-part polyester or epoxy-resin stone adhesive with 15- to 45-minute cure at 70 degrees F, in the formulation recommended by the adhesive manufacturer for the type of stone repair indicated, and matching stone color for stone-to-stone applications.

2.7.2 High Modulus, High Strength , moisture-insensitive epoxy adhesive wit a pot life of 30 minutes at 40 degrees F for mortar-to-stone applications.

2.7.3 Epoxy Performance Requirements:

2.7.3.1 Tensile Elongation: 2.5 percent minimum per ASTM D 638.

2.7.3.2 Tensile Strength: 3,500 psi minimum per ASTM D 638.



2.7.3.3 Compressive Strength: 6,000 psi minimum per ASTM D 695.

2.7.3.4 Water Absorption (24 hours): 0.5 percent ASTM D 570.

2.7.4 Stone Filler shall be stone of the same type and color as the stone being patched and shall be ground to approximately the texture of coarse sand.

2.7.5 Pigments shall be natural and synthetic iron oxides and chromium oxides, compounded for mortar mixes and of the type that will not react with the epoxy adhesive.

2.7.6 Thickening Powder shall be silicon carbide powder.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Removal of Deteriorated Material: Chip out all deteriorated stone in areas to be patched to sound material. Square cut or undercut edges to a minimum 1-inch depth to form a key for patching material.

3.1.2 Cleaning: Clean area to be patched and dry thoroughly.

3.2 Installation:

3.2.1 Patching Stone:

3.2.1.1 Brush-coat stone surfaces with mortar-to-stone adhesive. Brush-coat stone surfaces with a slurry coat of patching mortar. Comply with manufacturer's instructions. Place patching mortar in layers no thicker than 2 inches. Roughen surface of each layer to provide a key for the next layer. Build up patch 1/4 inch above surrounding stone and carve surface to match adjoining stone after mortar has hardened.

3.2.1.2 Keep each layer damp for 72 hours or until mortar has set.

3.2.2 Replacing Stone:

3.2.2.1 Cut Replacement Stone accurately to shape and dimensions with joints and bonding as required.

3.2.2.2 Exterior Sill Stones, Panels, Copings, Cornice, and Similar Stones with exposed top surfaces shall be cut to set on their natural beds and shall have a wash on the top surface.

3.2.3 Setting Stone:

3.2.3.1 Where stone is backed up with concrete or concrete blocks, coat the face of the backup material with an approved non-staining asphalt complying with ASTM D 449, Type D.

3.2.3.2 Provide expansion or control joints in stonework as required.

3.2.3.3 Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. Tool joints after setting to match joints of surrounding stone.

3.2.4 Pointing and Cleaning:

3.2.4.1 Upon completion, all joints shall be carefully pointed.

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3.2.4.2 Clean stone surfaces using fiber brushes and tri-sodium phosphate solution.



SECTION 04510 MASONRY RESTORATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for general masonry restoration. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Abrasive Blasting Material shall be a combination of friable, finely graded, clean particles, containing approximately 97.8 percent silicates and other minerals by weight. The material shall contain no free silica nor any crushed or quarried sand.

2.1.1 Sieve analysis for wet blasting aggregate shall be:

Sieve Mesh	Percent Retained	
	Min.	Max.

28	5	15
35	22	32
48	73	90

2.1.2 Aggregate for Dry Blasting: The size of aggregate for dry blasting shall be determined by careful material analysis for the given application.

2.2 Mortar Materials:

2.2.1 Hydrated Lime: ASTM C 207, Type S or N.

2.2.2 Cement:

2.2.2.1 Portland Cement: ASTM C 150, Type I or II.

2.2.2.2 Masonry Cement: ASTM C 91.

2.2.2.3 Cement shall not have more than 0.60 percent alkali (sodium oxide) nor more than 0.15 percent water soluble alkali in the combination of lime and cement.

2.2.3 Aggregate:

2.2.3.1 Coarse Aggregate: ASTM C 404 and not containing any substance that will stain the masonry.

2.2.3.2 Sand for Use with Masonry: ASTM C 144. Sand shall not contain any substance that will stain masonry.

2.2.3.3 Sand for Use with Stone: ASTM C 33.

2.2.4 Admixtures: Do not use admixtures of any kind in mortar, unless otherwise indicated.

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2.2.5 Colored Masonry Cement: ASTM C 979. Mortar colors shall be high purity, chemically inert, color-fast, and alkali-proof mineral oxides. Color shall not exceed a pigment-to-cement ratio of 1:10 by weight; carbon black shall not exceed 3 percent of the cement weight.

2.2.6 Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

2.2.7 Mortar Proportions shall be as follows as specified in ASTM C 270, Proportion Size, Type N:

Portland Cement	Hydrated L ime	Sand
1	1	6

Add pigments if required.

2.3 Grout: Grout shall be a flexible, non-shrink, non-staining grout specifically formulated for use in masking and grouting complying with ASTM C 476.

2.4 Masking Material shall be a special masking tape, compatible with the grout technique.

2.5 Caulking and Sealant shall comply with ASTM C 920.

2.6 Backup Material for sealant shall be closed-cell resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oil-less dry jute, or rope yarn.

2.7 Bond Preventive Material shall be pressure sensitive polyethylene tape, aluminum foil complying with ASTM D 1056 or ASTM D 1565.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 General: Clean masonry surfaces free from efflorescence, mildew, fungus, graffiti, vines, tentacles, and all other blemishes. Wire brushing or sandblasting will not be allowed for paint removal.

3.1.2 Deteriorated Material: For re-pointing, tuck pointing, masking, and grouting, cut out old mortar in brickwork to a minimum depth of 1/2 inch and cut out old mortar in stonework to a minimum depth of 1 inch. Deteriorated material shall be removed to the full depth of mortar disintegration. Following cleaning, blow joints clean to remove all dust, dirt, and remaining loose aggregate.

3.2 Masonry Cleaning:

3.2.1 Washing: A specialized aeration type nozzle shall be used to project water at 1,000 or 1,200 psi pressure. Any evidence of masonry material damage or removal shall be cause for immediate work stoppage.

3.2.2 Steam Cleaning: Scrub all surfaces to be cleaned with a mild soap or detergent. Apply steam at a pressure of 10 to 30 psi to thoroughly flush and remove all foreign matter and to neutralize and rinse away all cleaning solutions.

3.2.3 Chemical Cleaning:



3.2.3.1 Acidic Products shall be used only on acid-tolerant materials such as granite, sandstone, and unglazed brick.

3.2.3.2 Alkaline Cleaners shall be used only on acid-sensitive materials such as limestone and marble.

3.2.3.3 Surfactants shall be used only on polished granite or glazed brick.

3.2.4 Abrasive Blasting:

3.2.4.1 Wet Aggregate Blasting shall be performed using a specialized nozzle that combines specified aggregate, clean water and air. Water pressure shall not exceed 150 psi. Air pressure shall not exceed 70 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.

3.2.4.2 Dry Aggregate Blasting shall be continuous bombardment of the masonry surface with a finely divided aggregate. Air pressure shall be between 20 and 100 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.

3.2.5 Re-pointing and Tuck-pointing:

3.2.5.1 Pointing of Brickwork: Compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill all joints with mortar and pack the back corners of the joint.

3.2.5.2 Painting of Stonework: Compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill joints with a layer of mortar 1/2 inch deep and pack the back corners of the joint. Approximately 1 hour later, apply another layer of mortar completely filling the joint.

3.2.5.3 Tooling: Tool the joint to match the appearance of the adjacent mortar joints with a round jointer to produce smooth, dense, concave joints.

3.2.6 Masking and Grouting:

3.2.6.1 Masking: Mask the face of each individual masonry unit, keeping the edge of the tape 1/16 inch away from all edges of the masonry unit to allow an overlap of the grouting material onto the masonry.

3.2.6.2 Grouting: Completely fill all joints, cracks, and voids with grout.

3.2.6.3 Cleaning: Keep all exposed masonry clean and free of mortar as work progresses. Clean masonry surfaces using fiber brushes and trisodium phosphate solution. Rinse surfaces with clean water immediately after cleaning.

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DIVISION 05 METALS



Section 05020 Anchor Bolts And Expansion Anchors

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of anchor bolts and expansion anchors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Anchor Bolts and Nuts: ASTM A 307; Hot-dipped galvanized, ASTM A 153.

2.2 Flat Washers: ANSI B18.2.1, of the same material as bolt.

2.3 Expansion Anchors:

2.3.1 Lead Shield Type: Fed. Spec. FF-S-325, Group I, Type 1, Class 1.

2.3.2 Wedge Type: Fed. Spec. FF-S-325, Group II, Type 4, Class 1 or 2.

2.3.3 Self-Drilling Type: Fed. Spec. FF-S-325, Group III, Type 1.

2.4 Fabrication:

2.4.1 Anchor Bolts shall be "J" type for use in concrete or hooked type for use in masonry. All bolts shall be hot-dipped galvanized and furnished complete with nut and washer.

2.4.2 Expansion Anchors shall be of standard manufacture and unless otherwise specified shall be galvanized or cadmium-plated in accordance with Fed. Spec. FF-S-92.

3.0 EXECUTION:

3.1 Anchor Bolts shall either be cast in new concrete or regouted in place with non-shrinking grout.

3.2 Expansion Anchors shall be of the type best suited for the work. Embedment shall be as directed but in no case less than six times the bolt diameter. Minimum distance between the anchor center line and the edge of concrete shall not be less than 4-1/2 times the diameter of the hole in which anchor is installed.

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SECTION 05120 STRUCTURAL STEEL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural steel. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Structural Steel:

2.1.1 Carbon Grade Steel: ASTM A 36 / A 36M.

2.1.2 High-Strength Low-Alloy Steel: ASTM A 572 / A 572M, Grade 50.

2.1.3 Corrosion-Resistant High-Strength Low-Alloy Steel: ASTM A 242 / A 242M or A 588 / A 588M, Grade 50.

2.1.4 Quenched and Tempered Alloy Steel: ASTM A 514 / A 514M.

2.1.5 Structural Tubing: ASTM A 500, Grade B, ASTM A 501, or ASTM A 618.

2.1.6 Steel Pipe: ASTM A 53, Type E or Type S, Grade B. Weight Class to be Standard, Extra Strong or Double Extra Strong as indicated. Pipe finish may be black or galvanized as indicated.

2.2 Connections:

2.2.1 High-Strength Bolts: ASTM A 325 / A 325M or ASTM A 490 / A 490M including nuts and washers.

2.2.2 Carbon Steel Bolts: ASTM A 307, Grade A.

2.2.3 Carbon Steel Nuts: ASTM A 563, Grade A, Square or Hex Style.

2.2.4 Plain Washers, Other Than Those in Contact with High-Strength Bolts: ANSI B18.22.1, Type B.

2.2.5 Direct-Tension Indicators: ASTM F959, Type 490, Un-coated

2.2.6 Welding Electrodes: Comply with AWS D 1.1 "Structural Welding Code-Steel" requirements.

2.3 Finish: Galvanized, ASTM A 123 and ASTM A 153 or ASTM A 386 or shop primer, SPC Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)

2.4 Fabrication: Fabrication shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Fabrication and assembly shall be done in the shop to the greatest extent possible. Ends shall be square within the tolerances for milled ends specified in ASTM A 6. Non-galvanized structural steelwork, except surfaces to be field welded or friction bolted, shall be prepared for painting in accordance with the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and primed with the specified paint.



2.5 Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to Structural Steel Painting Council (SSPC) specifications as follows:

2.5.1 Hand Tool Cleaning – SSPC-SP 2

2.5.2 Power Tool Cleaning – SSPC-SP 3

2.5.3 White Metal Blast Cleaning – SSPC-SP 5

2.5.4 Commercial Blast Cleaning – SSPC-SP 6

2.5.5 Brush-Off Blast Cleaning - SSPC-SP 7

2.5.6 Picking - SSPC-SP8

2.5.7 Near-White Blast Cleaning - SSPC-SP 10

2.5.8 Power Tool Cleaning to Bare Metal - SSPC – SP 11

3.0 **EXECUTION:** Erection of structural steel shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

3.1 Connections: Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.

3.2 Base Plates and Bearing Plates: Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be dry-packed solidly with bedding mortar.

3.3 Galvanized Field Connections: Galvanized steel shapes shall be bolted connections only using galvanized bolts, nuts, and washers. Field welding of galvanized steel will not be permitted.

3.4 Field Welded Connections: Field welded structural connections shall be completed before load is applied.

3.5 Field Priming: After erection of non-galvanized structural steel, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

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SECTION 05130 STEEL DECK

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel roof and floor deck. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Deck Units: Deck units shall conform to the Steel Deck Institute (SDI) publication no. 29 "Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution". Span and lapping shall be as detailed on design drawings.

2.1.1 Roof Deck: Steel deck used in conjunction with insulation and built-up roofing shall conform to ASTM A 792/A 792M, ASTM A 611 or ASTM A 792/A 792M. Roof deck units shall be fabricated of 0.0295 inch design thickness or thicker steel or as shown on design drawings, and shall be painted, G90 coated or galvanized as required.

2.1.2 Acoustical Deck Units: Deck shall have a noise reduction coefficient of NRC 0.75 when measured in accordance with ASTM C 423 using ASTM E 795 Mounting Type F-25. Sound absorbing materials shall be either glass fiber in roll or pre-molded form for acoustical steel deck (non-cellular) or glass fiber rigid strip for acoustical steel deck (cellular) in accordance with manufacturer's standards.

2.1.3 Composite Deck: Deck to receive concrete as a filler, or for composite deck assembly, shall conform to ASTM A 653/A 653M or ASTM A 611. Deck used as the tension reinforcing in composite deck shall be fabricated of 0.0295 inch design thickness, or as shown on design drawings, and shall be zinc-coated in conformance with ASTM A 653/A 653M. Deck units used in composite deck shall have adequate embossment to develop mechanical shear bond to provide composite action between the deck and the concrete.

2.1.4 Form Deck: Deck used as a permanent form for concrete shall conform to ASTM A 653/A 653M or ASTM A 611. Deck used as a form for concrete shall be fabricated of 0.015 inch thickness or as shown on design drawings, and shall be painted with one coat of manufacturer's standard paint, G90 Coated, or zinc-coated in conformance with ASTM A 653/A 653M as shown.

2.2 Accessories: Metal accessories shall be of the same material as the deck and have minimum gauge as follows: saddles, 18-gauge; welding washers, 10-gauge; cant strip, 22-gauge; other metal accessories, 20-gauge; unless otherwise indicated.

2.3 Closure Plates: Voids above interior walls shall be closed with 22-gauge sheet metal where directed. Open deck cells at parapets, end walls, eaves, and openings through floors and roofs shall be closed with 22-gauge sheet metal.

2.4 Miscellaneous Steel Shapes: ASTM A 36 / A 36 M.

3.0 EXECUTION:

3.1 Erection of deck and accessories shall be in accordance with the SDI publication no. 29 "Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution". The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports



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before being permanently secured in place. The maximum uniform distributed storage load shall not exceed the design live load.

3.2 Attachment: The deck units shall be welded or fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners to supports in accordance with requirements of the SDI "Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution". All welding of steel deck shall be in accordance with American Welding Society (AWS) D1.3 using methods and electrodes as recommended by the manufacturer of the steel deck being used.

3.3 Repair of Coatings: Touch-up paint for shop-painted units shall be of the same type used for the shop painting. Touch-up paint for zinc-coated units shall be a galvanizing repair paint with a high-zinc dust content. Welds shall be touched-up with paint conforming to Steel Structure Painting Council (SSPC) Paint 20 in accordance with ASTM A 780. Finish of deck units and accessories shall be completed by using touch-up paint wherever necessary to prevent the formation of rust. Other coating shall be repaired as recommended by manufacturer.

3.4 Openings Through Deck: Holes and openings required shall be drilled or cut, reinforced, and framed for rigidity and sufficient load-carrying capacity. Holes less than 6 inches across require no reinforcement. Openings 6 to 12 inches across shall be reinforced by 22-gauge steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck a maximum of 12 inches on center. Openings larger than 12 inches shall be reinforced by steel angles on opposite sides of the opening and at a right angle to the deck ribs. Both sides of the angles shall be fastened to each rib. Angles shall extend at least two ribs beyond each side of the opening.

3.5 Shoring: Install temporary shoring before placing deck panels or concrete, if required to meet deflection limitations. Remove shoring only when conditions allow design deflections to be met.

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SECTION 05155 STEEL JOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel joists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Manufacturer must be certified by Steel Joist Institute SJI to manufacture joists complying with SJI standard specifications and load tables. Comply with AWS requirements and procedures for; shop welding, appearance, quality of welds, and methods used in correcting welding work.

2.1 Open Web Steel Joists: Steel joists shall conform to Steel Joist Institute SJI-01, K-Series. Joists shall be designed to support the loads given in the standard load table of SJI-01.

2.2 Long-span Steel Joists and Deep Long-span Steel Joists: Steel joists shall conform to SJI-01, LH-Series or DLH-Series. Joists shall be designed to support the loads given in the standard load tables of SJI-01.

2.3 Joist Girders: Joist girders shall conform to SJI-01.

2.4 Accessories and Fittings: Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed. Supply ceiling extensions of enough strength to support ceiling construction.

2.5 Shop Painting: Joists and accessories shall be shop-painted with a rust-inhibiting primer paint. The primer paint shall be limited to a primer that is compatible with the specified finish paint. Do not prime paint joists or accessories scheduled to receive sprayed fire-resistive materials.

3.0 EXECUTION: Joists shall be accurately set, and end anchorage shall be compatible with the bearing surface and the expansion requirements. Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging. Abraded, corroded, and field-welded areas shall be cleaned and touched up with the same type of paint used in the shop painting. After installation clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces.



SECTION 05180 MISCELLANEOUS STANDARD METAL ARTICLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous standard metal articles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wire Rope: Wire rope shall conform to ASTM A 475, high strength grade with Class A coating. Where possible, units shall have factory attached fittings. Fittings and accessories shall be hot-dip galvanized.

2.2 Safety Chains: Safety chains shall be galvanized welded steel, proof coil chain tested in accordance with ASTM A 467, Class CS. Safety chains shall be straight link style, 3/16 inch diameter minimum or as specified, 12 links per foot and with bolt type snap hooks on each end. Eye bolts for attachment of chains shall be galvanized 3/8 inch bolt with 3/4 inch eye, anchored as indicated. Two chains shall be furnished for each guarded opening.

2.3 Corner Protection: Steel angles with anchors, ASTM A 36; Galvanized, ASTM A 123.

3.0 EXECUTION: (Not Used)

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SECTION 05210 STEEL TRUSSES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel trusses. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Additional related information is included in Section 05120.

2.0 PRODUCTS:

2.1 Steel Trusses:

2.1.1 Structural Carbon Steel: ASTM A 36/ A 36M, unless otherwise indicated.

2.1.2 High-Strength Low-Alloy Structural Steel: ASTM A 242 / A 242M, Grade 42.

2.2 Steel Forgings: Forgings that are to be welded shall comply with Supplementary Provision S4 of ASTM A 668.

2.3 Fasteners:

2.3.1 High Strength Bolts, Nuts and Plain Hardened Washers: ASTM A 325 / A 325M.

2.3.2 Anchor Bolts: ASTM A 307.

2.4 Filler Metal for Welding: Electrodes for manual arc welding shall comply with AWS A5.1 or AWS A5.5.

2.5 Field Repair of Shop Primer: SPC Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)

3.0 EXECUTION:

3.1 Structural Metals:

3.1.1 Comply with AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" and "Code of Standard Practice," both as modified herein.

3.1.2 Piping and electrical wiring conflicting with erection of members shall be removed and placed in a new position approved by the Contracting Officer. Provide temporary utilities and coordination to prevent outages during this period.

3.1.3 Shop and field connections shall be high strength steel bolted unless otherwise indicated.

3.1.4 All metal parts shall be shop-fabricated. Assemblies shall be fitted together in the shop and delivered complete and ready for installation. Welds shall be made by operators who have been previously qualified in compliance with AWS standards to perform the type of work required. Welds exposed to view shall be dressed smooth.

3.1.5 Before members are assembled or installed, bearing surfaces to be in permanent contact shall be clean and free from dirt, scale, and corrosion. Immediately after cleaning, add a prime coat of red lead paint. Drifting to enlarge holes will not be permitted. Holes that must be enlarged to admit bolts shall be reamed.



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Poor matching of holes, caused by either shop errors or erection errors, shall be cause for rejection by the Contracting Officer. Steel erected under this contract shall be cleaned of any dirt, mud, or grease and left in a condition to receive coatings.

3.2 Strengthening of Deteriorated Members: Remove corrosion by wire brushing, sanding, or other approved method. Strengthen as directed.

3.3 Correction of Loose Connections: Remove loose rivets by cutting rivet heads off and removing the shank. If necessary, remove the rivet shank by drilling. Remove loose bolts in bolted connections. Bolts shall not be re-tightened. Install a new high strength bolt of the same size as the removed bolt or rivet, and tighten by the turn-of-the-nut method.

3.4 Repair of Bearings and Anchor Bolts: Remove corrosion by wire brushing, sanding, or other approved method. Additional repair requirements shall be as directed.

3.5 Repair of Tie Rods and Bracing: Tighten loose tie rods to the snug tight condition. Remove corrosion by wire brushing, sanding, or other approved method. Strengthen as directed.

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Section 05518 Pipe And Tube Railings

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of handrailings and ladders. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Post and Rails: Steel pipe, ASTM A 53, Type E or S, Grade B, Schedule 40.

2.2 Bars and Rungs: ASTM A 36.

2.3 Finish: Galvanized, ASTM A 123 or shop primer, Fed. Spec. TT-P-86, Type I or II; TT-P-645.

2.4 Fabrication:

2.4.1 Handrailings shall be smooth, with all projecting joints and sharp corners ground smooth. Welded joints shall be flush type. Members shall be neatly coped and continuously welded at all junctions of posts and rails. Flattening of the rail or post ends at junctions of posts and rails will not be permitted. Fittings or other connectors shall not be used at junctions of posts and rails.

2.4.2 Ladders: Rails shall be angle or flat bars. Rungs shall be round or square bars and shall project through rails. Welds shall be continuous.

2.4.3 Cages shall be provided as directed and shall be fabricated from flat bars. Vertical bars shall be inside supporting hoops. Bars shall be welded at each intersection.

3.0 EXECUTION: Hand rails and ladders shall be erected in accordance with the AISC Manual. Hand rails shall be rigidly attached to structure to provide unyielding obstruction. Ladders shall be bolted to structure unless otherwise directed.



SECTION 05520 METAL STAIRS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal stairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

See Section 05520 for railing and ladder requirements.

2.0 PRODUCTS:

2.1 Steel Plates, Shapes and Bars: ASTM A 36 / A 36M.

2.2 Steel Bar Grating: ASTM A 36 and ASTM A510 for wire rod for grating crossbars.

2.3 Gray Iron Castings: ASTM A 48, Class 30.

2.4 Malleable Iron Casting: ASTM A 47.

2.5 Cast Aluminum: ASTM B 26 or B 108.

2.6 Metal Pan Treads: Pressed or structural steel pans, ASTM A 446, Grade B, shop coated, with a minimum depth of 2 inches for concrete fill.

2.7 Cast Metal Treads shall have an integral non-skid surface.

2.8 Grating and Metal Pan Treads shall have cast metal non-skid nosings.

2.9 Finish: Steel plates, shapes, bars, and grating shall be galvanized in accordance with ASTM A 386 or primed with fabricator's standard lead and chromate free shop primer as directed. Galvanizing repair paint shall be high-zinc-dust content complying with SSPC-Paint 20.

2.10 Fabrication: Stair units shall be shop welded or bolted. Units shall be shop-assembled to ensure fit. Stairs are to be shipped in the largest units practical to reduce field erection time. All fabrication shall conform to AISC Manual and ASTM A 6. Welding shall be in accordance with American Welding Society (AWS) D 1.1 and D 1.3.

3.0 EXECUTION:

3.1 Erection: Erect stairs level and plumb. Treads shall be level both front to back and across the width. Stair units shall be securely fastened to floors and landings. Field erection shall be in accordance with AISC Manual except that connections shall be bolted only.

3.2 Repair of Coatings: Connections and abrasions in the shop coating shall be touched up with an approved galvanizing repair paint or primer to match shop primer.

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SECTION 05528 ORNAMENTAL HANDRAIL AND RAILINGS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ornamental handrail and railings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Tubing, Bars, and Shapes: Finishes are to be agreed upon prior to starting fabrication.

2.1.1 Aluminum: ASTM B 221 alloy 6063-T5/ T-52 or ASTM B 429 alloy 6063-T6.

2.1.2 Steel: ASTM A 36, A 500, Grade A, A 501, or ASTM A29 Grade 1010.

2.1.3 Bronze: ASTM B 135, Alloy C23000.

2.1.4 Stainless Steel: ASTM A 554, Grade MT304; ASTM A 312, Grade TP304; ASTM A 167, Type 304.

2.1.5 Brass: ASTM B 135, Alloy C28000 and ASTM B 455, Alloy C38500.

2.2 Castings:

2.2.1 Aluminum: ASTM B 26, 356-T6.

2.2.2 Steel: Gray Iron, ASTM A 48, Class 30; Malleable Iron, ASTM A 47.

2.2.3 Bronze: ASTM B 584, Alloy C92300.

2.2.4 Stainless Steel: ASTM A 743, Grade CF8 or CF20.

2.2.5 Brass: ASTM B 584, Alloy C85700.

2.3 Wood Handrails shall be hardwood handrail of species and profile selected from manufacturer's standards, bonded to metal sub-rail, with manufacturer's standard transparent finish, unless otherwise directed.

2.4 Fasteners: Furnish fasteners of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise directed. Unless otherwise directed provide Phillips flat-head screws for exposed fasteners.

2.5 Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.6 Fabrication: Stainless steel and steel handrails shall have welded connections. Aluminum handrails shall be either welded or non-welded. Bronze and brass handrail shall have non-welded connections.

2.6.1 Welded Connections: Fabricate handrails and railings of materials indicated for interconnections of members by welding. Pre-assemble railing units, to maximum extent practicable, consistently with shipping and handling limitations. Welding shall comply with applicable AWS specifications, using method appropriate



for metal and finish indicated. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

2.6.2 Non-welded Connections: Fabricate railings and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise directed. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

2.6.3 Protective Lacquer: Metal handrails shall be shop-coated with clear strippable non-yellowing lacquer, of type recommended for protection of the finished metal surface.

3.0 EXECUTION:

3.1 Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint. Prevent other galvanic action and forms of corrosion by insulating metal and other materials from direct contact with incompatible materials.

3.2 Expansion Joints: Provide expansion joints at locations directed or at intervals not to exceed 40 feet. Provide internal sleeve type slip-joint extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6 inches of post.

3.3 Provide Anchorage Devices and Fasteners where necessary for securing ornamental metal items to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

3.4 Form Tight Joints with exposed connections accurately fitted with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of the work, restore finishes to eliminate any evidence of such corrective work.

3.5 Protection Protect handrail finishes from damage during construction period. Remove protection and restore hand rail to like-new condition prior to acceptance of work.

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SECTION 05530 GRATING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grating. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aluminum Grating, Banding, and Kick Plate: Rectangular, pressure-locked bearing bars, ASTM B 221/ B 221 M, 6063-T6 or 6061-T6, mill finish for bearing bars of gratings and shapes. 6061-T1 for grating crossbars.

2.2 Steel Grating:

2.2.1 Steel Plates, Shapes, and Bars: ASTM A36 / A 36M. Wire Rod for Grating Crossbars ASTM A 510 / A 510M. Galvanized Steel Sheet ASTM A 653 / A 653M, structural quality, Grade 33.

2.2.2 Bands and Kick Plate: ASTM A 36.

2.2.3 Finish: Galvanized, ASTM A 123 or painted with fabricator's standard shop primer.

2.3 Fabrication: Rectangular floor grating shall be in accordance with the "Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads" MGB 531, published by the National Association of Architectural Metal Manufacturers (NAAMM). Heavy Duty Metal Bar Gratings shall comply with NAAMM MBG 532, "Heavy Duty Metal Bar Grating Manual". Where openings are directed in the grating, sections shall be laid out so that section edges will be centered on the openings. All openings shall be provided with kick plate or banding or required. All raw edges of grating shall be banded unless directed otherwise. Welding shall be in accordance with American Welding Society (AWS) D1.1, D1.2, and D1.3.

2.4 Shop Primer: Lead and chromate free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.5 Grating Fasteners:

2.5.1 Ferrous and Galvanized provide type 304 or 316 stainless-steel fasteners.

2.5.2 Aluminum Provide fasteners of aluminum, nonmagnetic stainless steel, zinc-plated steel or other fastener warranted by manufacturer to be compatible with aluminum grating system.

3.0 EXECUTION:

3.1 Erection: Grating shall be anchored in place with welded stud bolts and saddle clips or other acceptable fasteners. Gratings shall be installed level and plumb without racking.



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3.2 Touchup shall be either with an approved galvanizing repair paint or a primer to match shop primer. Coat surfaces of aluminum in contact with concrete, masonry or wood with bituminous paint.

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SECTION 05540 CASTINGS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of castings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedure shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Frames, Covers, and Steps:

2.1.1 Gray Iron: ASTM A 48, Class 30.

2.1.2 Steel: ASTM A 27 / A 27M or ASTM A 148 / A 148M; Galvanized, ASTM A 123.

2.1.3 Aluminum: ASTM B 26 / B 26 M, alloy 356-T6.

2.2 Corner Protection: Steel angles with anchors, ASTM A 36; Galvanized, ASTM A 123.

2.3 Ventilation Boxes: Extruded Aluminum, ASTM B 221, 2063-T6.

2.4 Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

3.0 EXECUTION:

3.1 Frames, Steps, Corner Protection, or Other Castings to be embedded in concrete shall be accurately positioned and securely anchored to forms prior to placement of concrete.

3.2 Castings to be located in masonry or other building material shall be temporarily braced and held firm to ensure accurate placement in final construction.

3.3 Aluminum Surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals shall be coated with a heavy coat of bituminous paint.



SECTION 05556 ORNAMENTAL SHEET METAL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ornamental sheet metals. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Materials:

2.1.1 Steel Sheet: ASTM A 527, galvanized or ASTM A 366/ A 366M, Class I.

2.1.2 Aluminum Sheet: ASTM B 209, Alloy 5052-H32 or ASTM B 209, Alloy 6061-T6

2.1.3 Extruded Aluminum: ASTM B 221 / B 221M, Alloy 6063-T6, T-52.

2.1.4 Extruded Bronze: ASTM B 455, Alloy UNS No. C38500 and ASTM B 135, Alloy C8000.

2.1.5 Bronze Plate or Sheet: ASTM B 36/ B 36M, alloy UNS No. C28000

2.1.6 Stainless Steel: ASTM A 554, Grade MT304; ASTM A 312, Grade TP304; ASTM A 167, Type 304.

2.2 Wall Louvers: Weather-resistant type, with bird screens and made to withstand a wind load of not less than 30 lb/sf. Wall louvers shall bear the Air Movement and Control Association (AMCA) certified rating program seal for air performance and water penetration in accordance with AMCA-500 and AMCA-511. The rating shall show a water penetration of 0.20 or less at 800 fpm.

2.2.1 Extruded Aluminum Louvers: Fabricated of extruded ASTM B 221 / B 221M 6063-T6 or 6063-T52 aluminum with a wall thickness of not less than 0.080 inch thick.

2.2.2 Formed Metal Louvers: Formed of zinc-coated steel sheet not thinner than 16 U.S. gauge, or aluminum sheet not less than 0.08 inch thick.

2.2.3 Mullions: Same material and finish as louvers.

2.2.4 Screens and Frames: Minimum 1/4-inch square mesh and minimum 16-gauge aluminum bird screen. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 Door Louvers: Inverted "Y" or "V" sight-proof type not less than 1-3/8 inch thick with matching metal trim. Louvers for exterior doors shall be weather-resistant type.

2.3.1 Extruded Aluminum Door Louvers: Minimum 0.050 inch thick 6063-T6 or 6063-T52 aluminum alloy. Frame and trim shall be clamp-in "L" type.

2.3.2 Formed Metal Door Louvers: Minimum 20 U.S. gauge steel sheet or minimum 0.050 inch thick sheet aluminum. Trim shall be beveled "Z" molding both sides.

2.3.3 Screens and Frames: Screen shall be aluminum, RR-W-365, Type VII. Mount screens in removable frames, capable of having screen replaced, of same material and finish as the louvers.

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2.4 Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

2.5 Finishes: Comply with National Association of Architectural Metal Manufacturers' (NAAMM) "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Protect exposed finishes from damage by applying a strippable temporary protective covering before shipping.

2.5.1 Aluminum: Factory-applied anodic coating, organic coating, or baked enamel.

2.5.1.1 Anodic Coating: AA-M10-C22-A31, Architectural Class II, clear finish or AA-M10-C22-A32, Architectural Class II, integral color finish.

2.5.1.2 Organic Coating: AAMA 605.2, 0.8 mil minimum dry film thickness, baked enamel finish.

2.5.1.3 Baked-Enamel Finish: AA-C12C42R 1X, Apply baked enamel finish complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

2.5.2 Steel: Factory-applied coating, rust-inhibitive primer and baked enamel finish coat, 1 mil minimum total dry film thickness.

2.6 Motorized Louvers: Electric motor shall be completely encased in the louver sill. Motor shall be U.L. approved, and comply with applicable NEMA standards, 120 volt, 60 hertz with a transformer.

3.0 EXECUTION:

3.1 Copper or Copper-Bearing Alloys: Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2 Aluminum: Where aluminum contacts metal other than zinc, paint the dissimilar steel with a primer and two coats of aluminum paint.

3.3 Metal: Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.4 Wood: Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.



SECTION 05814 EXPANSION JOINT COVERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of building expansion joint covers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Frames and Covers:

2.1.1 Aluminum: ASTM B 221, 6063-T6.

2.1.2 Bronze: ASTM B 455, Alloy C 38500.

2.1.3 Stainless Steel: ASTM A 167, Type 304.

2.2 Resilient Filler: Neoprene, elasto-meric, or extruded vinyl.

2.3 Bituminous Paints: SSPC-Paint 12 (cold-applied asphalt mastic).

2.4 Fabrication: Shop assemble components and package with anchors and fittings. Provide joint components in single lengths whenever practical.

3.0 EXECUTION: Install assembly in accordance with manufacturer's printed instructions using anchors appropriate for the joining materials.

3.1 Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 Installation: Rigidly anchor expansion assembly to both sides of expansion joints to prevent misalignment.

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SECTION 05910 WATER TREATMENT PLANT DEBRIS RACKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation materials for repair and maintenance of debris racks for water treatment plant intake structures. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Manually Cleaned Racks: Repair or replacement parts for manually cleaned racks shall be galvanized or alloy steel rods, bars, or structural shapes. Galvanized material shall comply with ASTM A 153 and B 633. Alloy steel material shall comply with ASTM A 193, A 480; and A 564, as applicable.

2.2 Fasteners shall comply with ASTM A 307 or A 325 for bolts and A 502 for rivets.

2.3 Welding Electrodes shall comply with American Welding Society (AWS) D 1.1 "Structural Welding Code-Steel" requirements.

3.0 EXECUTION:

3.1 Silt Removal: Cofferdams and temporary bypass inlets shall be provided to allow de-watering. Water level shall be lowered, and silt and debris shall be pumped, shoveled, or otherwise removed from around rack. Silt and debris shall be disposed in an approved manner.

3.2 Repair or Replacement of Structural Members, Rods, and Shapes shall be by welding, bolting or riveting, as applicable to the existing construction. All welding shall be in compliance with AWS D1.1.



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SECTION 06056 TIMBER BRIDGE COMPONENTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of timber bridge components. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Timber for Bridges shall comply with the specifications for timber bridges contained in the state's standard specifications.

2.2 Preservative Treatment shall comply with the specifications for preservative treatment contained in the state's standard specifications. All timber shall be treated unless specified otherwise.

2.3 Hardware and Castings:

2.3.1 Castings: Cast steel shall comply with ASTM A 27, Grade 70-36, or gray iron castings shall comply with AASHTO M105 Class No. 30, unless otherwise specified.

2.3.2 Hardware:

2.3.2.1 Machine Bolts, Drift-Bolts, and Dowels may be either wrought iron or rolled steel. Machine bolts shall have the square heads and nuts unless otherwise specified.

2.3.2.2 Cast Washers shall be made of malleable or gray iron. The outside diameter shall not be less than 3 1/2 times the bolt diameter and its thickness equal to the bolt diameter. Plate washers shall be made of wrought iron or rolled steel. The outside diameter shall not be less than 3 1/2 times the bolt diameter, and they shall not be less than 1/4 inch thick.

2.3.2.3 Nails and Spikes shall be hot-dip zinc coated per ASTM A 153 or of Type 304 stainless steel.

2.3.2.4 Finish: Unless otherwise specified, all hardware for treated timber bridges shall be galvanized or cadmium-plated. Galvanizing shall comply with ASTM A 123 or A 153. Cadmium plating of steel shall comply with ASTM B 766.

2.4 Timber Connectors shall be ring type or plate type and shall be galvanized in compliance with ASTM A 123 or A 153.

2.4.1 Split Ring: Fabricated from hot rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33 of standard manufacture.

2.4.2 Tooth Ring: Stamped cold form 16-gauge steel sheet fabricated from hot rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33 standard manufacture.

2.4.3 Shear-Plate Timber Connectors:



2.4.3.1 Pressed Steel Type shall be fabricated from hot rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33. Shear plates shall be of standard manufacture.

2.4.3.2 Malleable Iron Type shall be ASTM A 47, Grade No. 32510 (ASTM A 47M, Grade 22010). Casting shall be of standard manufacture.

2.5 Structural Glue-Laminated Timber shall comply with DOC PS 20, American Structural Lumber Standard, AITC 190.1 and AITC 111. Lumber for laminating shall be of such stress grade as to provide glue-laminated members with allowable stress values of 2,000 psi in bending, 1,600 psi in tension, 1,500 psi in compression parallel to grain, and 385 psi in compression perpendicular to grain for dry condition of service.

2.5.1 Adhesives shall meet requirements for wet condition of service.

2.5.2 Surfaces of Members shall be sealed with a penetration sealer or sealed with a sealer coat.

2.6 Ties: Fabricate strap ties from hot-rolled steel sheet complying with ASTM A 570 (ASTM A 570M). Hot dip galvanize after fabrication to comply with ASTM A 123 or ASTM A 153 (ASTM A 153M).

2.7 Asphalt Cement shall comply with ASTM D946 for penetration-graded material.

2.8 Surface Coarse Aggregate shall be ASTM D 692, except the gradation shall be as follows:

Sieve Size	Percent Passing (Wt.)

1/2 in.	100
3/8 in.	94-100
No. 4	15-45
No. 16	0-4

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size and placement of all traffic control color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.

3.1.2 Treated Timber: Give all cuts, abrasions, and holes made after treatment 2 applications of 60 percent creosote oil and 40 percent roofing pitch or brush coat with 2 applications of hot creosote oil and covered with hot roofing pitch. Any unfilled holes, after being treated with preservative oil, shall be plugged with treated plugs.

3.2 Erection:

3.2.1 Holes:

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3.2.1.1 Drift Bolts and Dowels: Bore holes for round drift bolts and dowels with a bit 1/16 inch less in diameter than the bolt or dowel to be used. The diameter of holes for square drift bolts or dowels shall be equal to the least dimension of the bolt or dowel.

3.2.1.2 Machine Bolts and Rods: Bore holes for field fabrication with a bit the same diameter as the bolt. Holes for fabrication prior to treatment shall be 1/16 inch larger than the bolt diameter.

3.2.1.3 Lag Screws: Bore hole with a bit not larger than the body of the screw at the base of the thread.

3.2.2 Nuts and Washers: Use a washer of the size and type specified under all bolt heads and nuts except carriage bolts. The nuts of all bolts shall be locked by scoring threads after they have been finally tightened.

3.2.3 Countersinking: Paint all recesses in treated timber formed for countersinking with hot creosote oil. Fill recesses likely to collect injurious materials with hot pitch.

3.2.4 Framing: All lumber and timber shall be accurately cut and framed to a close fit in such manner that the joints will have even bearing over the entire contact surfaces. Place stringers in position so that knots near edges will be in the top portions of the stringer. Screw type fastenings shall be screwed into place for the entire length of the fastener. Install the split ring and the shear plate in grooves cut by the Contractor. Force the toothed ring into the contact surfaces of the timbers jointed by means of pressure equipment.

3.2.5 Nailing: Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood.

3.3 Maintenance and Repair Methods:

3.3.1 Timber Deck:

3.3.1.1 Remove Existing Plank Floor Deck and Fasteners and replace with new planks and fasteners. Lay the floor planks at 45 degrees to centerline of roadway. When more than one length of plank is required, stagger joints between abutting ends at least 3 feet in any two adjacent lines of plank.

3.3.1.2 Standard Wrought Washers shall be used under the heads of all lag screws and under the heads or nuts of all machine bolts. Where machine bolts are used for fastening the floor plank all nuts used shall be locknuts. Countersink heads of all lag screws and bolts in the surface of the floor. Fill recesses formed for countersinking with hot pitch.

3.3.1.3 Bituminous Surface Coat: Clean the floor of foreign materials. Apply asphalt cement at a temperature of 275 F to 350 F and at a rate of approximately 1/4 gallon per square yard of surface. The deck shall be dry at the time of bitumen application. Cover the entire surface with a thin coating of aggregate in a sufficient quantity to take up any free bitumen.

3.3.2 Hardware: Remove all corrosion by sandblasting or wire brushing. Replace all loose bolts and screws, adding washers as required. Replace deteriorated hardware.

3.3.3 Metal Tread Plates: Remove and replace treads as directed. Before installing treads, remove high spots and rough spots in the plank floor so that the treads will be in contact with the floor for their full length and width. Treads shall be laid in a heavy mop coat of asphalt filler. Treads shall be laid with a space of 1/4 inch between adjacent ends and shall be fastened by means of 3/8-inch galvanized bolts. Where bolts cannot be used, use 3/8-inch by 3-inch galvanized lag screws.



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3.3.4 Timber Railroad Bridge Deck: Remove defective ties and guardrail, including fasteners, and replace with similar ties, guardrail, and fasteners as directed.

3.3.5 Repair of Structural Timber Members: Repair, including removal and replacement, shall be as directed.



SECTION 06116 LIGHT WOODEN STRUCTURES FRAMING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for light wooden structures framing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Grading and Marking: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which they were produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Except for structural laminated members, plywood, and lumber, bundle marking or certificates will be permitted in lieu of marking each individual piece. Species and grades are listed in Table 1 at the end of this section.

2.2 Sizes: Lumber sizes shall comply with DOC PS 20, "American Softwood Lumber Standards" under which produced, and unless otherwise specified, lumber shall be surfaced on four sides.

2.3 Moisture Content: At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

2.3.1 Provide dressed lumber, S4S, unless otherwise indicated.

2.3.2 Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2 inch thickness or less, unless otherwise indicated.

2.3.3 Provide lumber with 15 percent maximum moisture content at time of dressing for 2 inch thickness or less, unless otherwise indicated.

2.3.4 Provide treated and untreated lumber over 2 inches in thickness, except roof planking with 25 percent maximum moisture content.

2.3.5 Provide roof planking 2 inches or more in thickness with a maximum 15 percent moisture content.

2.3.6 Materials Other Than Lumber: In accordance with standard under which product is produced.

2.4 Wood Member Design:

2.4.1 Trussed Rafters: As an option to standard rafters, trussed rafters may be provided. Connections shall be made with light metal plate connectors. Light metal plate connected wood trusses shall be designed in conformance with TPI Design Specifications for Metal Plate Connected Wood Trusses and fabricated in conformance with the TPI Quality Standard for Metal Plate Connected Wood Trusses and manufacturing tolerances of ANSI/TPI 1.

2.4.2 Non-stress Graded Members shall include plates, caps, bucks, studs, framing for skirting and other miscellaneous framing, blocking, nailers, sleepers, and grounds. Members shall be standard grade or No. 2 grade except studs may be stud grade. Non-stress member grades shall conform to the National Grading Rule



for Dimension Lumber established in conformance with the rules or standards under which produced and as applied in individual grading rules of applicable grading agencies.

2.4.3 Structural Glued Laminated Members shall be in accordance with AITC 117 and AITC 190.1. Appearance grade shall comply with AITC 110. Members shall be sealed with a penetrating sealer that is compatible with indicated finish. Use a wet-use type adhesive complying with ASTM D 2559.

2.5 Preservative Treatment: Lumber not over 5 inches thick and plywood, when in contact with soil, shall be treated in accordance with AWPB LP-22, LP-33, or LP-44; when specified to be painted or used in built-up roofing systems, AWPB LP-2 or LP-22; and for all other purposes, AWPB LP-2, LP-3, or LP-4. Except as otherwise specified, lumber over 5 inches thick shall be pressure preservative-treated in accordance with AWPB C2. Structural glued laminated timber shall be treated in accordance with AWPB C28. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be marked with the word "Dry." Creosote or coal-tar solutions shall not be used. Surfaces of lumber that will be exposed shall not be incised. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPB M-4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Unless otherwise specified, all wood members exposed to weather or in contact with soil, water, masonry, or concrete, and all wood framing members directly above soil when the bottom elevation is 18 inches or less above soil shall be pressure preservative-treated. The following items will always be treated:

- a. All wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
- b. All wood members in contact with slabs-on-grade, including wood floor sleepers over waterproofed slab surface.
- c. All wood members in contact with foundation walls.
- d. Furring strips used on walls or partitions below grade.
- e. Furring strips used on exterior walls above grade.
- f. All wood members used for rough framing of openings in exterior concrete or masonry walls.
- g. All wood members used in exterior exposed construction such as steps, platforms, walkways, railways, and framing for skirting and other miscellaneous framing.
- h. Nailing strips used over fiberboard or gypsumboard wall sheathings as a base for wood shingles.

2.6 Fire-Retardant Treatment: Fire-retardant treated wood shall be pressure-treated in accordance with AWPB C20 for lumber and AWPB C27 for plywood. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D 2898 prior to being tested for compliance with AWPB C20 or C27.

2.7 Connectors, Anchors, and Accessories: Fabricate from structured-steel shapes, plates, and bars complying with ASTM A 36 (ASTM A 36M); steel bars complying with ASTM A 575, Grade M 1020; and hot-rolled

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carbon steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33. Hot-dip galvanize to comply with ASTM A 123 or ASTM A 153.

3.0 EXECUTION:

3.1 All Nailing shall be in accordance with the Recommended Nailing Schedule as contained in NFOPA Manual for Wood Frame Construction.

3.2 Installation of Timber Connectors shall conform to applicable requirements of the NFOPA National Design Specification for Wood Construction.

3.3 Members shall be framed for passage of ducts and pipes and shall be cut, notched, or bored in accordance with applicable requirements of the NFOPA Manual for Wood Frame Construction.

3.4 Framing shall be kept at least 2 inches away from chimneys and 4 inches away from fireplace backwalls.

3.5 Leveling of Joists, Beams, and Girders on Masonry or Concrete shall be with slate or steel; on wood or metal, leveling shall be without shims.

Grading Rules	Species	No. 1	No. 2
NHLA	Red Oak	X	
NELMA	Northern Pine		X
	Eastern Hemlock-Tamarack		X
SPIB	Southern Pine	X	
WCLB	Douglas Fir-Larch		X
	Hem-Fir	X	
WWPA	Douglas Fir-Larch		X
	Hem-Fir	X	
	Douglas Fir-South	X	



SECTION 06140 SHEATHING, SIDING, AND SUBFLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheathing, siding, and subflooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Bundle marking or certificates will be permitted in lieu of marking each individual piece, except for structural laminated members, plywood, and lumber. Size and moisture content shall conform to requirements of the rules or standards under which materials are produced.

2.2 Plywood shall be in accordance with DOC PS 1, Grade C-D for wall sheathing and Grade C-D with exterior glue for roof sheathing, unless otherwise specified.

2.3 Roof Decking Design Stresses shall be as specified for structural members. Decking shall be tongue and groove, V-jointed, and matched and dressed where exposed. As an option, fabricated, laminated lumber decking with interlocking tongue and groove joints may be provided.

2.4 Sheathing shall be of either fiberboard, gypsum board, plywood, V-structural-use panels, or wood for wall sheathing; and either plywood, structural-use panels, or wood for roof sheathing and skirting for temporary structures including access doors through skirting as required.

2.4.1 Fiberboard shall be in accordance with ANSI/AHA A194.1, Type cellulosic fiberboard sheathing with square edges, Class 1 (regular density) or Class 2 (intermediate density).

2.4.2 Gypsum Board shall be in accordance with ASTM C 79.

2.4.3 Structural-Use Panels shall meet the qualification requirements of APA Performance Standards and Policies for Structural-Use Panels. Panels shall conform to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or Ext; or Structural I Rated Sheathing, Exp 1 or Ext.

2.4.4 Wood shall be center-matched, ship-lapped, or square-edge, except exposed roof sheathing shall be V-jointed, matched and dressed. Species and grade shall be in accordance with Table 1 at the end of this section.

2.5 Shear Wall Panels shall be of plywood or sheathing conforming to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or 2, or Ext; or Structural I or II Rated Sheathing, Exp 1 or Ext.

2.6 Subflooring shall be of either plywood, structural use panels, or wood.

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2.6.1 Plywood shall conform to DOC PS 1; Grade C-D for uses not otherwise specified, Grade C-D with exterior glue for reception of underlayment as wood flooring, underlayment grade with exterior glue or C-C (Plugged), and exterior or exposure 1 grade for use as a combination subfloor-underlayment under resilient flooring.

2.6.2 Structural-Use Panels shall be APA Rated structural-use panels qualified for subflooring or combination subfloor-underlayment under APA Performance Standards and Policies for Structural-Use Panels.

2.6.3 Wood shall be center-matched, ship-lapped, or square-edge. Species and grade shall be in accordance with Table 1 at the end of this section.

2.6.4 Adhesive shall conform to APA AFG-01.

2.7 Underlayment shall be either hardboard, particleboard, or plywood.

2.7.1 Hardboard shall be in accordance with ANSI A135.4, service class 4, surface SIS, with back side sanded to produce boards of uniform thickness.

2.7.2 Particleboard shall be in accordance with ANSI A208.1, Grade PBU, thickness as indicated.

2.7.3 Plywood shall be in accordance with DOC PS 1, underlayment grade B-C Exterior with fully sanded face, thickness as indicated but not less than 1/2 inch.

2.8 Moisture Barrier of Building Paper shall be asphalt-saturated organic felt conforming to ASTM D 226, Type I (No. 15 asphalt felt), unperforated or air retarder complying with ASTM E 1677, 3 mils thick.

3.0 EXECUTION:

3.1 Nailing shall be in accordance with the Recommended Nailing Schedule as contained in NFOPA Manual for Wood Frame Construction.

3.2 Sheathing Installation:

3.2.1 Fiberboard sheathing shall be applied with edges 1/8 inch apart at joints, fitted snugly at abutting frames of openings, and nailed or stapled. Sheets 2 feet wide shall be applied horizontally with the tongued groove up and with vertical joints over supports and staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.

3.2.2 Gypsum Board Sheathing shall be applied with edges in light contact at joints and nailed. Sheets 2 feet wide shall be applied horizontally with tongued edge up and with vertical joints over supports and staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.

3.2.3 Plywood Sheathing shall be applied with edges 1/8 inch apart at side joints, 1/16 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates. If applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have face grain at right angles to supports with end joints made over supports and staggered.

3.2.4 Structural-Use Panels shall be applied with edges 1/4 inch apart at side joints, 1/8 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of



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edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates and, if applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have end joints made over supports and staggered.

3.2.5 Wood Sheathing: End joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 8 inches and less in width and three nails for boards more than 8 inches in width.

3.3 Subflooring Installation: A clearance of 1/4 inch shall be provided at walls. Plywood subflooring and structural-use panel subflooring may be installed with adhesive conforming to APA AFG-01 and nails spaced at 12 inches on center. Installation of subflooring with adhesives shall be in accordance with APA Design/Construction Guide: Residential and Commercial. Each plywood or structural-use panel shall have end joints made over supports and staggered. Where finish flooring of different thicknesses is used in adjoining areas, wood strips of the thickness required to bring the finish flooring surfaces to the same plane shall be used under the subfloor panels. Plywood subflooring shall be applied with the face grain at right angles to the supports, with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints. Structural-use panel subflooring shall be applied over two or more supports with the long dimension across supports and with edges 1/4 inch apart at side joints and 1/8 inch apart at end joints. Wood subflooring shall bear on at least three supports.

3.4 Installation of Underlayment shall be applied with edges 1/32 inch apart at joints and a clearance of 1/4 inch at walls. Joints at underlayment shall not be located directly over parallel joints at subflooring. Power driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. When plywood combination subfloor-underlayment is used in lieu of separate layers, it shall be installed as specified for plywood subfloor, except all joints shall be made over supports with edge joints spaced 1/8 inch apart and end joints spaced 1/16 inch apart. When plywood combination subfloor-underlayment is tongued and grooved, only end joints shall require support. Tongued and grooved combination subfloor-underlayment shall be applied with joints spaced 3/32 inch apart.

3.5 Installation of Shear Wall Plywood or Structural-Use Panels shall be installed with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports.

3.6 Moisture Barrier shall be applied over all wood wall sheathing, over studs to directly receive horizontal siding or board siding, over any wall sheathing to receive an unbacked stucco base, and over square edge wood subflooring to receive wood strip flooring. Moisture barrier over sheathing shall be applied horizontally, starting at the bottom, lapped 6 inches at edges and ends, and nailed at laps 16 inches on center. Moisture barrier over subfloor shall be applied as the strip flooring installation progresses and lapped 2 inches at edges and ends.

SPECIES AND GRADE

Subflooring, Roof Sheathing, Wall Sheathing, Furring

Grading Rules	Species	Standard Comm	Const Board	No.2 Comm	No.3 Comm
NHLA	Cypress			X	
NELMA	Northern White Cedar				X
	Eastern White Pine	X		X	
	Northern Pine	X		X	

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	Balsam Fir	X	
	Eastern Hemlock-Tamarack		

NHPMA	Eastern White Pine		
	Northern Pine		
	Balsam Fir		
	Eastern Hemlock-Tamarack		

RIS	Redwood	X	
SCMA	Cypress		X
SPIB	Southern Pine	X	

WCLB	Douglas Fir-Larch	X	
	Hem-Fir	X	
	Sitka Spruce	X	
	Mountain Hemlock	X	
	Western Cedar	X	

WWPA	Douglas Fir-Larch		X
	Hem-Fir	X	
	Idaho White Pine		X
	Lodgepole Pine		X
	Ponderosa Pine		X
	Sugar Pine	X	
	Englemann Spruce		X
	Douglas Fir South		X
	Mountain Hemlock		X
	Subalpine Fir	X	
	Western Cedar	X	



SECTION 06181 WOOD TRUSSES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for maintenance and repair of wood trusses. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Structural Glue-Laminated Timber shall comply with DOC PS 20, American Structural Lumber Standard, AITC 190.1 and AITC 111. Lumber for laminating shall be of a stress grade providing glue-laminated members with allowable stress values of 2,000 psi in bending, 1,600 psi in tension, 1,500 psi in compression parallel to grain, and 385 psi in compression perpendicular to grain for dry condition of service.

2.1.1 Adhesives shall meet requirements for dry condition of service.

2.1.2 Appearance of Members shall be Industrial Grade. Plywood shall comply with DOC PS 1.

2.1.3 Surfaces of Members shall be sealed with a penetrating sealer. Members shall be delivered individually wrapped. Do not unwrap until members are installed and adequate protection is provided.

2.2 Timber Connections:

2.2.1 Split-Ring Connectors shall be fabricated from hot rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33. Rings shall be of standard manufacture and shall fit snugly into pre-cut groove.

2.2.2 Shear Plate:

2.2.2.1 Pressed Steel Type shall be fabricated from hot rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33. Shear plates shall be of standard manufacture.

2.2.2.2 Malleable Iron Type: Casting shall comply with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010). Casting shall be of standard manufacture.

2.3 Fasteners:

2.3.1 Provide fasteners of size and type indicated that comply with requirements specified. When exposed to weather, in ground contact, or in area of high humidity, provide fasteners with hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

2.3.2 Miscellaneous Bolts and Screws: ASTM A 307 with ASTM A 563 (ASTM A 563M) hex nuts and flat washers. Type, size, and finish shall be best suited for the intended use.

2.3.3 Wood Screws: ASME B18.6.1.

2.3.4 Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M)

2.4 Saw Lumber:

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2.4.1 Lumber shall be one of the following species and commercial grades:

2.4.1.1 Douglas Fir-Larch North: Select structural per NLGA rules.

2.4.1.2 Southern Pine: No. 1 Dense per SPIB rules.

2.4.1.3 Douglas Fir-Larch: Select structural per WCLIB or WWPB rules.

2.4.2 Sizes, Grading and Marking shall comply with the requirements of the rules or standards under which produced, and unless otherwise indicated, lumber shall be surfaced on four sides. Dressed sizes shall be accepted as the minimum net sizes conforming to nominal sizes. Lumber shall be free from warp. All timber materials shall bear a grademark or other identifying marks indicating grades of material and standards under which produced. If lumber is treated, treatment and retention shall be indicated.

2.5 Preservative Treatment: All lumber shall be preservative-treated unless otherwise indicated. Pressure treat with water borne solution to comply with AWPB C2 for above ground use. After treatment, redry heavy timber to 19 percent maximum moisture content. Use preservative solution without water-repellent additive. Do not use chemicals containing arsenic or chromium. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPB M4.

2.6 Moisture Content: Provide timber with 19 percent maximum moisture content at the time of dressing or timber that is unseasoned at time of dressing but with maximum moisture content of 19 percent at the time of installation.

3.0 EXECUTION:

3.1 Wiring Conflicts: Piping and electrical wiring conflicting with erection of members shall be removed and placed in a new position approved by the Contracting Officer. Provide temporary utilities and coordination to prevent outages during this period.

3.2 Connections: Drive nails and spikes with just sufficient force to set the heads flush with the surface of the wood. Drill bolt holes a maximum of 1/16 inch larger than the diameter of the bolt. A washer not less than a standard cut washer, or in lieu thereof a metal plate or strap, shall be between the wood and the bolt head and between the wood and the nut. Lag screw holes for the unthreaded portion of the shank shall be the same diameter as the shank and the same depth as the length of the unthreaded shank. The lead hole for the threaded portion of the shank shall be properly sized for species of lumber involved. Insert the threaded portion of the lag screw into its lead hole by turning with a wrench.

3.2.1 Nails: Use 8-penny or larger nails for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; use 16-penny or larger nails for nailing through 2-inch thick lumber. Size and spacing of nails shall comply with NFOPA Specification for Stress-Graded Lumber and its Fastenings.

3.2.2 Wood Screws: Lead holes for withdrawal resistance shall have a diameter of 70 percent of the root diameter of the wood screw. Lead holes for lateral resistance shall have a diameter of 7/8 of the root diameter of the wood screw. The part of the hole receiving the shank shall be about 7/8 the shank diameter. Insert screws in the lead holes by turning with a screw driver or other tool.

3.2.3 Timber Connections: Install the split ring and shear plate in grooves cut by the Contractor.

3.3 Truss Connections and Splices: Tighten all loose bolts and screws, adding washers as required. Remove and replace severely corroded or deteriorated bolts and screws.



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3.4 Repair of Bearings and Anchor Bolts: Remove corrosion by wire brushing, sanding, or other approved method. Additional repair requirements shall be as directed.

3.5 Repair of Excessive Truss Deflection: Install tension turnbuckles or install a strengthening system as required to correct deflection.

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SECTION 06220 MILLWORK

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of millwork. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: All millwork products shall be marked with manufacturer's identification and grade, in compliance with Architectural Woodwork Institute (AWI) quality grade. Products shall conform to applicable requirements of AWI Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program and Woodwork Institute of California (WIC) Manual of Millwork.

2.2 Millwork: Millwork shall include the following representative examples of architectural woodwork:

- a. Exterior cornices, fasciae, and soffits.
- b. Trim for exterior and interior openings.
- c. Frames for exterior and interior doors and other openings (refer to Section 08210 for specifications).
- d. Casework.
- e. Wood shelving.
- f. Stairs and railings.

2.3 Wood Moisture Content: Lumber for millwork shall be kiln-dried to an average moisture content range of 9 percent to 13 percent for exterior work and 6 percent to 11 percent for interior work. Kiln-dried lumber shall have a maximum moisture content of 19 percent. Kiln-dried plywood shall have a maximum moisture content of 15 percent.

2.4 Grade of Work: Interior millwork surfaces that are to receive transparent finishes shall be premium grade of the species selected in compliance with DOC PS 20. Millwork surfaces that are to be painted shall be custom grade of the species selected.

2.5 Fire-Retardant Marking: Each unit of fire-retardant treated wood (per AWPAC20) and plywood (per AWPAC27) shall be marked with the producer's label and UL label showing grade and rating.

2.6 Preservative Treatment: Exterior millwork and designated interior millwork shall be preservative-treated in accordance with NWWDA L.S.4, AWPAC2, and AWPAC9. Use a preservative that will not interfere with the designated finish. Apply field treatment brush coat on surfaces cut after preservative treatment complying with AWPAC4.

3.0 EXECUTION: Millwork shall be installed plumb, level, true, and straight with no distortions. Millwork that abuts adjoining work shall be scribed and cut to fit. Millwork shall be installed with a minimum number of joints, coped at returns, mitered at corners, and shall comply with quality standards for joinery.



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SECTION 06240 CABINETS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cabinets. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cabinets shall comply with AWI Section 400 and WIC Section 14.

2.2 Countertops shall comply with AWI Section 400 and WIC Sections 14 (wood), 16 (laminate), and 17 (solid-surfacing-material).

2.3 Materials:

2.3.1 Particleboard shall be ANSI A208.1 mat-formed particleboard, Grade 1-M-2 with minimum density of 40 lbs/cu ft, internal bond of 60 psi; and minimum screw holding capacity of 225 lbs on faces and 200 lbs on edges.

2.3.2 Plastic Laminate shall be NEMA LD 3.

2.3.3 Hardwood Plywood shall be HPVA HP-1.

2.3.4 Hardwood Lumber shall be clear, dry, sound, and free of defects, First Grade Lumber (NHLA).

2.3.5 Hardboard shall be AHA A135.4, Class 1, tempered.

2.3.6 Decorative Boards shall be low pressure melamine plastic laminate composite panels.

2.3.7 Medium Density Fiberboard shall be ANSI A208.2.

2.4 Transparent Finish Construction Wood Cabinet:

2.4.1 Solid Lumber and Plywood Face Veneer shall be selected for compatible grain and color of the species.

2.4.2 Semi-Exposed Materials:

2.4.2.1 Solid Lumber: Dry, sound, selected to eliminate appearance defects, of any species of hardwood or softwood, with color and grain characteristics similar to exposed portions.

2.4.2.2 Plywood: Species to match color and grain of exposed members; with particleboard core or veneer core.

2.4.3 Style of Face Construction: Provide base, wall, and full height units with drawer fronts, doors, and fixed panels overlaying and concealing face frames of cabinet body, as required.

2.4.4 Face Frame Style: Provide base, wall, and full height units with face frames of cabinets exposed around drawer fronts and doors.



2.4.4.1 Drawer Fronts and Doors: Surface applied or recessed flush with cabinet front, as required.

2.4.4.2 Flush Style Door Construction: Lumber core plywood, 5-ply with hardwood face veneers and cross banding.

2.4.4.3 Flush Style Drawer Fronts: Same construction as door, or solid or glued-up lumber, not less than 1/2 inch thick.

2.4.4.4 Stile and Rail Drawer Fronts and Doors: Of design selected, with stiles and rails of solid lumber, 3/4 inch thick for doors and 5/8 inch thick for drawer fronts.

2.5 Countertop Construction:

2.5.1 Exposed Surfacing Material: High pressure plastic laminate, 0.050 inch thick, general purpose type (GP50); except where post-formed countertop configuration is required, when 0.042 inch thick, post-forming type (PF42) shall be used.

2.5.2 Substrate (Core) for Exposed Surfacing Material: Particleboard.

2.5.3 Countertop Configuration: Provide countertops with front styles (nose), cove, and back-splash style, as required.

2.5.4 Countertop Thickness: Not less than 1-1/2 inches with substrate (core) not less than 3/4 inch thick.

2.6 Cabinet Hardware: ANSI/BHMA A156.9.

2.7 Accessories: Provide designated accessories.

3.0 EXECUTION: (Section not used.)

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SECTION 06250 WOOD PANELING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood paneling. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Paneling shall bear a stamp, brand, or other identifying mark indicating quality, construction and compliance with the grading rules of the respective grading and inspecting agency for the species and product indicated complying with DOC PS 20, AWI and WIC standards. Marking shall be placed on blind sides only.

2.2 Hardboard: AHA A135.4.

2.3 Medium-Density Fiberboard: ANSI A208.2.

2.4 Particleboard: ANSI A208.1.

2.5 Softwood Plywood: DOC PS 1.

2.6 Hardwood Plywood and Face Veneers: HPVA HP-1.

2.7 High-Pressure Decorative Laminate: NEMA LD 3.

2.8 Fire-Retardant-Treated Materials: Achieve flame-spread ratings and smoke developed ratings for product type complying with ASTM E 84.

3.0 EXECUTION:

3.1 Preparation: Backprime material when exposed to moisture and high relative humidity.

3.2 Installation:

3.2.1 Plywood Paneling: Where grain character or color variations are noticeable, select and arrange panels on each wall for best match of adjacent panels. Install in accordance with manufacturer's instructions.

3.2.2 Board Type Paneling: Arrange in random-width pattern unless boards are of uniform width. Install in accordance with manufacturer's instructions.

3.2.3 Hardboard Products Type Paneling: Install in accordance with manufacturer's instructions.



DIVISION 07 THERMAL & MOISTURE PROTECTION



Section 07110 Bituminous Waterproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Waterproofing:

2.1.1 Primer: Asphalt waterproofing material shall comply with ASTM D 41.

2.1.2 Bitumen: A heavy-bodied bituminous compound of trowel consistency, heavily reinforced with fiber, complying with Fed. Spec. SS-C-153, Type I.

2.2 Tar Waterproofing:

2.2.1 Primer: Creosote complying with ASTM D 43.

2.2.2 Bitumen: Coal-Tar Pitch complying with ASTM D 450.

3.0 EXECUTION:

3.1 Primer:

3.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.

3.1.2 Creosote: Apply by brush, roller, or power spray.

3.2 Bitumen:

3.2.1 Asphalt: Apply a 1/16 inch coating by trowel in a continuous unbroken film. Wait 24 hours and apply a second 1/16 inch coating.

3.2.2 Coal-Tar Pitch: Apply with mop or roller in a continuous, unbroken film, free from pinholes over any exposed surface area. Wait 24 hours and apply second coat.



Section 07111 Bituminous Membrane Waterproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous membrane waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Membrane Waterproofing:

2.1.1 Primer: Asphalt waterproofing compound complying with ASTM D 41.

2.1.2 Joint Covering: Asphalt saturated felt, complying with ASTM D 250.

2.1.3 Membrane: Burlap fabric, complying with ASTM D 1327; open mesh fiberglass, smooth, evenly woven to permit complete penetration of asphalt compound complying with ASTM D 1668, Type I; or asphalt-coated or saturated felt, complying with ASTM D 250.

2.1.4 Bitumen: A heavy-bodied bituminous compound of trowel consistency complying with Fed. Spec. SS-C-153, Type I.

2.1.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement. The board shall be an asphaltic core board or asphalt-saturated fiberboard complying with ASTM C 208. Thickness shall be 1/8 inch.

2.2 Tar Membrane Waterproofing:

2.2.1 Primer: Creosote complying with ASTM D 43.

2.2.2 Joint Covering: Coal-tar saturated felt, complying with ASTM D 227.

2.2.3 Membrane: Burlap fabric complying with ASTM D 1327; open mesh fiberglass, smooth, evenly woven to permit complete penetration of coal-tar compound; or coal-tar coated or saturated felt.

2.2.4 Bitumen: Coal-tar pitch complying with ASTM D 450.

2.2.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement shall be provided. The board shall be an asphaltic core board or asphalt saturated fiberboard. If used with coal-tar products, the board shall be faced with a polyethylene film to separate dissimilar materials. Thickness shall be 1/8 inch.

3.0 EXECUTION:

3.1 Installation:

3.1.1 Primer:

3.1.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.

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3.1.1.2 Creosote: Apply by brush, roller, or power spray.

3.1.2 Bitumen and Membrane:

3.1.2.1 Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur, with no less than two plies of fabric in alternate coats of bitumen.

3.1.2.2 All penetrations through the wall such as pipes, conduits, etc., shall be sealed with two additional plies.

3.1.2.3 Apply the specified number of plies of membrane material in alternate coats of bitumen.

3.1.2.4 For vertical applications, secure membranes near the top of each course.

3.1.2.5 Coat last ply of membrane with a thorough coat of bitumen.

3.2 Protection: As the membrane is completed, apply the protection course. Apply the protection board in a solid coating of asphalt or coal-tar pitch. All coatings must be dry before application of the protection board. Apply protection board by the lap method (lap each sheet 6 inches over preceeding sheet) or by the batten method (butt each sheet then apply a 6-inch strip of protection board in adhesive over all joints).



SECTION 07115 PLASTIC SHEET WATERPROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic sheet waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Butyl Sheet shall be an impermeable butyl rubber membrane 1/16 inch thick having a tensile strength of 1,200 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D 412. Butyl sheet shall be resistant to ozone and remain flexible to 40 F below zero.

2.2 Neoprene Sheet shall be an impermeable, self-extinguishing, ozone-resistant material 1/16 inch thick. Neoprene shall have a tensile strength of 1,500 psi minimum, complying with ASTM D 412, and an elongation of 250 percent minimum, complying with ASTM D 412.

2.3 Ethylene Propylene Diene Monomers (EPDM) Sheet shall be an impermeable membrane resistant to ozone and ultraviolet. EPDM shall have a tensile strength of 1,400 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D 412.

2.4 Vinyl Sheet shall be heavy-duty polyvinyl chloride sheet, complying with ASTM D 3083.

2.5 Primers: As required.

2.6 Adhesives:

2.6.1 Adhesive for Cold Application shall be a non-setting bitumen cut-back asphalt.

2.6.2 Adhesive for Hot Application shall be asphalt complying with ASTM D 312, Type III.

2.7 Butt Joint Tape: Elastomeric vapor barrier in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.

3.0 EXECUTION:

3.1 Primer: Apply primer by brushing or spraying uniformly over surface to receive membrane. Allow primer to dry before applying membrane.

3.2 Membrane:

3.2.1 At Footings, shape the membrane to conform to the surface by cutting a strip of sufficient width to seat over the footing and at least six inches up the wall.

3.2.2 On Vertical Surfaces, apply adhesive to both wall and membrane.



SECTION 07120 FLUID-APPLIED WATERPROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Two-Component Polyurethane: Two component, self-curing urethane system to form a seamless, permanently flexible and waterproof coating. Compound shall be a light-weight, 99 percent solids, liquid-applied system.

2.2 Single Component Polyurethane: One-part moisture cured elastomeric urethane for adhesion to concrete or wood. Compound shall be hard, flexible material with resistance to weather, gas, oil, and salt water having a temperature range of -65 F to +200 F.

2.3 Two-Component Polyurethane Rubber Base: Liquid-applied, elastomeric two component urethane rubber, 100 percent solids materials containing no coal-tar or asphaltic extenders. After proper mixing, with activators that are supplied as a unit, it shall cure to an elastomeric urethane rubber.

2.4 Two-Component Polysulfide Base Liquid Polymer: Two-component, chemically-curing, high-solids compound containing liquid polysulfide polymer. Product shall be furnished in two components: Part 1, consisting of the cure agent and suitable reinforcing agents; Part 2, the base component, incorporating liquid polysulfide polymer.

2.5 Modified Polyurethane Coal-Tar (Spray Grade): Two-part product, consisting of: Part 1, a blend of polyurethane resins, and Part 2, containing a selected blend of coal-tars, catalysts, and modifiers. The cured membrane shall be a seamless, low modulus, high elongation, physically and chemically resistant synthetic rubber.

2.6 Modified Polyurethane Coal-Tar (Trowel Grade): One component polyurethane coal-tar modified compound that forms a continuous seamless, flexible, impervious membrane when applied to vertical or horizontal surfaces.

2.7 Elastomeric Sheet Reinforcing: Smooth, evenly woven, open mesh glass fiber fabric weighing 1/4 ounce per square foot and which permits complete penetration of waterproofing compounds.

2.8 Protection Board: Rigid or semi-rigid board for protection of membrane waterproofing shall be an asphaltic core board or an asphalt saturated fiberboard complying with ASTM C 208. Protection board shall be 1/8 inch thick. If used with coal-tar products, the board shall be faced with a polyethylene film to separate dissimilar materials.

3.0 EXECUTION:

3.1 Two-Component Polyurethane:

3.1.1 Prime surfaces as required.

3.1.2 Spray machine mixed membrane coating directly onto the prepared surfaces to the desired thickness.



3.1.3 Apply the second spray coat after application of the first coat.

3.2 Single Component Polyurethane:

3.2.1 Prime surfaces as required.

3.2.2 Application shall be spray-applied.

3.2.3 Below grade exterior applications shall receive two coats.

3.3 Two-Component Polyurethane Rubber Base:

3.3.1 Prime surfaces as required.

3.3.2 Apply compound by hand trowel to a thickness of 1/16 inch.

3.3.3 Before membrane is completely cured, place protection board over the surface.

3.4 Two-Component Polysulfide Base Liquid Polymer:

3.4.1 Fill all joints and cracks over 1/8 inch in width with a polysulfide polymer base sealant. Apply a bond breaker over the joint and cover with 100 mil coating of the elastomeric material.

3.4.2 Apply membrane by spray in a continuous unbroken film. Surface coverage shall be at the rate of approximately 20-25 square feet per gallon to produce a thickness of 60 mils.

3.5 Modified Polyurethane Coal-Tar (Spray Grade):

3.5.1 Prime surfaces with required primer.

3.5.2 Apply with proper spray equipment in a continuous unbroken film. Application rate shall be approximately 25 sq. ft. per gallon to produce a thickness of 60 mils.

3.6 Modified Polyurethane Coal-Tar (Trowel Grade):

3.6.1 Prime surfaces with required primer.

3.6.2 Mix and apply with hand trowel in a continuous unbroken film.

3.6.3 Place protection board after membrane has attained its initial set.

3.7 Elastomeric Sheet Reinforcing for Fluid-Applied Waterproofing: Trowel fabric into first coat of membrane while membrane material is soft and pliable. Install sheet reinforcing in compliance with membrane compound manufacturer's requirements.

3.8 Protection Board:

3.8.1 Apply protection board over membrane while membrane material is still tacky.

3.8.2 Apply protection board by the lap method.



Section 07125 Metal Waterproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Lead Sheet and Strip shall be fabricated from 99 percent pure soft lead or lead alloy containing six to seven percent antimony. Four or eight pound per square foot lead shall be used for all work.

2.2 Copper Sheet and Strip shall be fabricated of 16 or 20 ounce per square foot tough-pitch copper. Copper shall be either hot-rolled soft copper or cold-rolled copper. Copper shall have a lead coating of 15 pounds per 100 square feet of copper (7-1/2 pounds on each face of copperplate).

2.3 Solder: Solder shall be 50 percent lead and 50 percent tin solder with a resin flux.

2.4 Bituminous Paint shall be high quality proper bodied bituminous (asphalt) compound of brush or spray consistency. Compound shall contain a hydrophilic wetting agent to ensure proper adhesion. Bituminous paint shall comply with ASTM D41.

3.0 EXECUTION:

3.1 Lead Pan Waterproofing:

3.1.1 Preparation: All surfaces on which lead is to be applied shall be smooth; rough projections shall be eliminated. Lead surfaces in contact with uncured concrete, mortar, or in other corrosive locations shall be given a coat of bituminous paint prior to installation.

3.1.2 Small Holes and Spot Repairs shall be accomplished by soldering the leak spots.

3.1.3 Large Damaged Areas shall be cut out and replaced with lead sheet or strip of the proper weight lead. Apply a coating of bituminous paint to the affected area after the new sheet or strip lead has been soldered in place.

3.1.4 Joints: Use optimal size of sheet or strip to compensate for expansion. Pre-tin all soldered joints and clean immediately after soldering. All joints shall be soldered.

3.1.5 Corners: Wall sheets shall end short of corners. Mold full sheet around corners and joint with wall sheets each side of corner.

3.2 Copper Waterproofing:

3.2.1 Preparation: All surfaces on which copper is to be applied shall be smooth; rough projections shall be eliminated. Give copper surfaces in contact with uncured concrete, mortar, dissimilar metals, or in other corrosive locations a coat of bituminous paint prior to installation.

3.2.2 Fabrication: Prefabricate shapes as required. Copper sheet and strip shall be bent only to rounded angles with no sharp creases.



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3.2.3 Small Holes and Spot Repairs shall be accomplished by soldering.

3.2.4 Large Damaged Areas shall be cut out and replaced with copper sheet or strip of proper weight. Apply a coating of bituminous paint to the affected area after the new sheeting or strip copper has been soldered in place.

3.2.5 Joints: Use optimal size sheet or strip to compensate for expansion. Pre-tin all soldered joints and clean immediately after soldering.



Section 07130 Bentonite Clay Waterproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bentonite clay waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Preformed Bentonite Clay Panels and Tubes:

2.1.1 Panels shall be made of dry bentonite granules packed into the corrugated flutes of biodegradable kraft boards. Panels shall be four feet square by 3/16 inch thick and weigh 18 pounds.

2.1.2 Tubes shall be a water soluble polyvinyl alcohol container filled with dry granular bentonite and hermetically sealed. Tubes shall be two-inch diameter by two-foot lengths and weigh approximately three pounds.

2.2 Bentonite Gel: Clay composition of hydrated aluminum silicate, which swells upon absorption of water into a thick gel.

2.3 Joint Seal: A hydrated bentonite gel for trowel application to concrete for sealing construction joints, form tie voids, and wall penetrations.

2.4 Joint-Pak Containers: A biodegradable kraft container filled with dry bentonite granules for preformed concrete joints in below grade foundation walls. Standard joint-paks shall be 1-1/4 x 1-1/4 inches, weighing approximately 1.1 pounds. Provide triangular-shaped cross section 2-3/8 x 2-3/8 x 2-3/8 inches x 2 feet long, weighing approximately 3 pounds for inside corner joints.

2.5 Chemically Modified Bentonite For Spray Application: High pressure spray combining bentonite clay with a modified asphalt binder that adheres the bentonite to vertical surfaces. Clay content shall be 1-1/2 pounds per square foot.

2.6 Moisture Barrier: 4 mil polyethylene sheeting complying with ASTM D 2103.

2.7 Protection Board: Multi-ply, semi-rigid board composed of a mineral fortified asphaltic core between a layer of asphalt saturated liner and a weathercoated glass mat liner with polyethylene film facing. Protection board shall be 4 feet by 8 feet by 1/8 inch.

2.8 Masonry Nails: 2-inch minimum by No. 9 fluted masonry nails with 1-inch minimum diameter disks complying with Fed. Spec. FF-N-105 for fastening panels to concrete and masonry walls.

3.0 EXECUTION:

3.1 Maintenance and Repair Methods:

3.1.1 Preformed Bentonite Panels:

3.1.1.1 Prior to Installation of Panels, parge all joints and cracks with joint seal to 1/8-inch minimum depth and 3-inch minimum width. Apply panels with masonry nails, joint seal, or approved mastic. Fold and



attach panels around corners with corrugations horizontal. Lap all adjoining panel edges 1 1/2 inches and stagger vertical joints of succeeding courses.

3.1.1.2 Install Polyethylene Sheeting immediately after panels are installed to provide temporary protection to bentonite panels against moisture. Overlap sheeting four inches. Apply sheeting with adhesive.

3.1.1.3 Install Protection Board with the asphalt-saturated felt face against the waterproofing for protection from damage by maintenance and repair activities including backfilling.

3.1.1.4 Bentonite Tubes: Place bentonite tubes along the base of the first panel course on sidewall applications to provide protection at the footing-foundation joint.

3.1.2 Chemically Modified Bentonite Spray:

3.1.2.1 Remove Damaged Material if damage is extensive, and completely clean area of application.

3.1.2.2 If Small Spot Repair is all that is required, cover damaged area with bentonite panel or pour loose dry granular bentonite adjacent to the damage. 3.1.2.3 For Large Scale Repair Work, apply a spray coating of minimum 3/8-inch bentonite to the damaged surface.

3.1.2.4 At Foundation-Footing Joint Spray, application shall be two inches thick in a cove or cant configuration.

3.1.2.5 Spray Joints with a double thickness, resulting in a membrane 3/4 inch to one inch thick. For small areas, joint seal may be trowel-applied.

3.1.3 Miscellaneous Joint Seals:

3.1.3.1 Bentonite Gel shall be trowel-applied to concrete for sealing construction joints, form tie voids, and wall penetrations.

3.1.3.2 Bulk Granular Bentonite may be poured at the base joints of walls and foundations.

3.1.3.3 Press Joint-Pak Containers filled with dry granular bentonite into preformed joint cavities next to PVC waterstop in joints between two concrete pours.



Section 07160 Bituminous Dampproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Dampproofing:

2.1.1 Primer: ASTM D 41.

2.1.2 Cement, Bituminous Plastic: ASTM D 449. A heavy-bodied asphalt emulsion of brush or power spray consistency.

2.1.3 Asphalt: ASTM D 449. Hot asphalt or asphalt emulsions for mop application.

2.2 Tar Dampproofing:

2.2.1 Primer: Creosote complying with ASTM D 43.

2.2.2 Bitumen: Coal-tar pitch complying with ASTM D 450.

3.0 EXECUTION:

3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

3.2 Installation:

3.2.1 Application of Dilute Asphalt Emulsion Primer: Brush or spray in a continuous unbroken film, free from pinholes or other surface breaks. 3.2.2 Application of Creosote Primer: Apply with a brush or roller to entire surface.

3.2.3 Interior and Exterior Cold Application: Brush or spray apply without thinning in a continuous unbroken film, free from pinholes or other surface breaks. Apply to entire primed area.

3.2.4 Exterior Hot Application:

3.2.4.1 Coal-Tar Pitch: Apply over exposed surface area with mop or roller in a continuous, unbroken film, free from pinholes.

3.2.4.2 Asphalt: Mop two coats of hot asphalt over the entire primed area. Use not less than 25 pounds per 100 square feet.



Section 07170 Silicone Dampproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of silicone dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of material shall be as required to support the work.

2.0 PRODUCTS: Silicone water repellent (5 percent solution) shall be a clear, ready to use liquid consisting of polymerized silicone resins and penetrating hydrocarbon solvents specifically formulated to repel water. Silicone solution shall comply with Fed. Spec. SS-W-110.

3.0 EXECUTION:

3.1 Precautions: Immediately remove any solution that comes in contact with glass surfaces. Protect glass surfaces with polyethylene.

3.2 Installation: Apply silicone solution by brush or a low pressure spray unit. If pumped from a barrel, use an agitator. Apply in one or two coats so that the surface is flooded to the point of maximum absorption. Start at top and work down, providing a continuous rundown of 6 to 12 inches during application. Start at top with second coat as soon as drop has been made.

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SECTION 07175 WATER-REPELLENT COATING DAMPPROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water-repellent coating dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: The materials shall be colorfast, non-yellowing, and impervious to the following solutions:

- Water.
- One percent soap solution.
- Salt solutions.
- Most dilute acids.
- Most alkalies.
- Urine.
- Color fast and non-yellowing.

2.2 Acrylic Sealers: Clear, water-white, non-staining sealing compound shall consist of a blend of penetrating and film-forming materials in a petroleum distillate and a methylacrylate resin and shall have a flash point (tag open cup) of 82 F minimum. The product must breathe and have the ability to be later recoated without any special treatment.

2.3 Polymeric Resins: Clear, colorless, inorganic polymer water repellents for impregnating and hardening the surfaces. The product must breathe and have the ability to be later recoated without any special treatment.

2.4 Polyester Resins: A mixture of modified polyester resins.

2.5 Butyrate Resins: Clear liquid, one component mixture of selected butyrate resins in a mineral spirit base.

3.0 EXECUTION:

3.1 Preparation: Prior to application of dampproofing, fill voids, cracks, and holes with cement mortar.

3.2 Installation: Coating may be applied by conventional spray equipment, airless spray equipment, brush, or roller.



SECTION 07180 CEMENTITIOUS DAMPPROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Portland Cement: ASTM C 150, Type I cement shall be used when the special properties of other types are not required.

2.2 Sand: Washed silica sand graded within the following limits:

Sieve	Percent Passing
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

2.3 Water: Clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

2.4 Bonding Agent:

2.4.1 A Re-Emulsifiable One-Component Liquid Resinous Emulsion shall be used where area is not subject to constant dampness.

2.4.2 A Two-Component Epoxy Resin Compound shall be used in areas under damp conditions.

2.5 Waterproofing Admixtures: A calcinated solution of colloidal resins that increases impermeability, workability, and compressive strength of mortar.

3.0 EXECUTION:

3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

3.2 Installation:

3.2.1 Bonding Agent: Apply as required.

3.2.2 Bearing Surface: Parge or apply a coating of the cementitious mixture to the areas to be dampproofed, using a brush or trowel. Minimum thickness shall be 1/4 inch.



Section 07192 Bituminous Vapor Barrier For Roofs

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous vapor barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Primer: ASTM D 41.

2.2 Bitumen:

2.2.1 Asphalt: ASTM D 312, Type III, steep asphalt.

2.2.2 Coal-Tar Pitch: ASTM D 450, Type A, for slopes up to and including 1/2 inch per foot.

2.3 Bituminous Cement: Fed. Spec. SS-C-153.

2.3.1 Type I: For use with asphalt saturated felts.

2.3.2 Type II: For use with coal-tar saturated felts.

2.4 Vapor Barrier Membrane:

2.4.1 Asphalt Saturated Organic Felt: ASTM D 226, No. 15, asphalt saturated organic fiber felt weighing approximately 13 pounds per square.

2.4.2 Asphalt Saturated Inorganic Felt: ASTM D 250, No. 15, asphalt saturated asbestos fiber felt weighing approximately 13 pounds per square.

2.4.3 Coated Base Sheet: ASTM D 2626, asphalt saturated organic fiber roofing felt, both faces coated with asphalt including mineral stabilizers and mineral surfacing, weighing not less than 37 pounds per square.

2.4.4 Coal-Tar Saturated Felt: ASTM D 227, No. 15 coal-tar pitch saturated organic felt weighing minimum of 13 pounds per square.

2.4.5 Sheathing Paper: Rosin-sized sheathing paper weighing not less than 5 pounds per square or saturated felt weighing approximately 7-1/2 pounds per square.

2.5 UL Listing: Bituminous vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Bituminous vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.6 FM Listing: Bituminous vapor barrier materials of roofing systems that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Bituminous vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.



3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete Decks: Prior to installation of vapor barrier, apply asphalt primer at the rate of 1 gallon per square over area to receive vapor barrier.

3.1.2 Precast Concrete Decks: Prior to installation of vapor barrier, cover joints between precast units with a 4-inch to 6-inch widestrip of roofing felt embedded in, and coated with, bituminous cement. Prime deck surface to receive vapor barrier with asphalt primer applied at rate of 1 gallon per square.

3.1.3 Wood Deck: Prior to installation of vapor barrier, apply one layer of sheathing paper over areas to be surfaced with vapor barrier.

3.2 Installation:

3.2.1 Laying Felts: Lay vapor barrier free of wrinkles or bubbles, at right angles to the slope of the deck.

3.2.2 Mopping: Solid mop heated bitumen under and between felts.

3.2.3 Embedment in Bitumen: Broom in felts with 18-inch or 20-inch wide soft fiber type broom.

3.2.4 Nailing Felts: Drive nails and fasteners for securing roofing flush through flat metal disks.

3.2.5 Embedding Vapor Barrier at Roof Edge: Embed vapor barrier felts in 9-inch wide solid coat of bituminous plastic cement.

3.3 Installation to Non-Nailable Deck:

3.3.1 Asphalt Saturated Felt System: Vapor barrier system shall consist of two-ply asphalt saturated felts embedded in solid moppings of asphalt applied at rate of 15 to 20 pounds per square per ply.

3.3.2 Coal-Tar Saturated Felt System: Vapor barrier system shall consist of two-ply coal-tar saturated felts embedded in solid moppings of coal-tar pitch applied at rate of 20 to 30 pounds per square per ply.

3.3.3 Coated Base Sheet System: Vapor barrier system shall consist of two-ply coated base sheet embedded in solid moppings of asphalt applied at rate of 20 pounds per square per ply.

3.4 Installation to Nailable Deck:

3.4.1 Asphalt Saturated Felt System: Vapor barrier system shall consist of two-ply asphalt saturated felt, first ply laid dry and second ply embedded in solid mopping of asphalt applied at rate of 15 to 20 pounds per square.

3.4.2 Coal-Tar Saturated Felt System: Vapor barrier system shall consist of two-ply coal-tar saturated felts, first ply laid dry and second ply embedded in solid mopping of coal-tar pitch applied at rate of 20 to 30 pounds per square.

3.4.3 Coat Base Sheet System: Vapor barrier system shall consist of two-ply coated base sheet. Apply first ply dry. Embed second ply in solid coating of asphalt applied at the rate of 15 to 20 pounds per square.

3.4.4 Attachment to Existing Vapor Barrier Membrane: Install a 25-inch wide strip of vapor barrier felt; lap existing membrane 6 inches.

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SECTION 07193 LAMINATED SHEET VAPOR BARRIER FOR ROOFS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated sheet vapor barrier for roofs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Vapor Barrier:

2.1.1 Reinforced Paper Laminate: Two layers of high strength kraft papers laminated together with asphalt, reinforced with glass fiber, with vapor transmission rating of 0.2 perm or less when tested in accordance with ASTM E 96.

2.1.2 Polyethylene Sheet Laminate: Two layers of high strength kraft papers, laminated, with polyethylene sheet between, with vapor transmission rating of 0.2 perm or less when tested in accordance with ASTM E 96, Procedure A.

2.2 Adhesive: Water-resistant adhesive with a nontoxic vehicle. Adhesive shall be vapor barrier manufacturer's recommended product and shall be compatible with contact surfaces.

2.3 Asphalt: ASTM D 312, Type III, steep asphalt.

2.4 Vapor Barrier Joint Strips: Vapor barrier material cut into strips, approximately 6 inches wide.

2.5 UL Listing: Laminated sheet vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Laminated sheet vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.6 FM Listing: Laminated sheet vapor barrier materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Laminated sheet vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Preparation: Surfaces to receive vapor barrier membrane shall be smooth, with no protruding surfaces that would puncture membrane.

3.2 Installation:

3.2.1 Application of Vapor Barrier with Adhesive: Lay vapor barrier sheet directly on deck in ribbons of adhesive approximately 1/2 inch wide and spaced 6 inches on center.

3.2.2 Application of Vapor Barrier with Asphalt: Lay vapor barrier sheet directly on deck in solid coat of asphalt applied at rate of 15 to 25 pounds per square.

3.2.3 Laps: Side laps shall be not less than 2 inches, and end laps shall be not less than 6 inches.

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3.2.4 Nailable Decks: Nail lapped areas, spacing nails maximum of 12 inches on center.

3.2.5 Sealing Joints: Seal joints in vapor barrier system and seal to other surfaces at extremities of coverage with vapor barrier strips.



SECTION 07194 POLYVINYL SHEET VAPOR BARRIER FOR ROOFS

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of polyvinyl sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:**

2.1 **Vapor Barrier:** Polyvinyl chloride sheet, minimum 4 mils thick, with vapor transmission rating of 0.2 perm or less when tested in compliance with ASTM E 96.

2.2 **Adhesive:** Water-resistant adhesive with a nontoxic vehicle specially prepared for application of polyvinyl sheet membrane to roof decks.

2.3 **Vapor Barrier Tape:** Aluminum foil, minimum 1 mil thick, laminated between two sheets of polyester film with pressure-sensitive adhesive on one face, vapor transmission of 0.015 perm or less.

2.4 **Vapor Barrier Joint Strips:** Vapor barrier material cut into strips, approximately 6 inches wide.

2.5 **UL Listing:** Polyvinyl sheet vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Polyvinyl sheet vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.6 **FM Listing:** Polyvinyl sheet vapor barrier materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Polyvinyl sheet vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.

3.0 **EXECUTION:**

3.1 **Preparation:** Surfaces to receive vapor barrier membrane shall be smooth, with no protruding surfaces that would puncture membrane.

3.2 **Installation:**

3.2.1 **Installation of Basic Membrane:** Lay polyvinyl sheet directly on deck in solid covering of approved adhesive.

3.2.2 **Nailable Decks.** Nail lapped areas, spacing nails maximum of 12 inches on center.

3.2.3 **Sealing Joints.** Seal joints in vapor barrier system and seal to other surfaces at extremities of coverage with vapor barrier tape or vapor barrier strips.

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SECTION 07196 BITUMINOUS VAPOR BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous vapor barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Vapor Barrier: Provide one of the following:

2.1.1 A Proper-Bodied Bituminous Coating of Brush or Spray Consistency for application to interior masonry walls above or below grade, containing a hydrophilic agent which assures proper adhesion. Compound shall comply with ASTM D 449.

2.1.2 A Soft, Adhesive "Self-Healing" Hot Mop Type Asphalt that flows readily under the mop and is not susceptible to wide temperature ranges. Compound shall comply with ASTM D 449, Type B. Used with a cold-applied primer complying with ASTM D 41.

2.2 Tar Vapor Barrier: Primer shall be coal-tar pitch complying with ASTM D 43 Type B for use below ground level under uniformly moderate temperature conditions, both during the process of installation and during service. The coal-tar pitch shall be homogeneous and shall comply with the requirements prescribed in Table I, ASTM D 450.

2.3 Reinforcing shall be tar-saturated felt complying with ASTM D 227 or glass mat complying with ASTM D 1668.

3.0 EXECUTION:

3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

3.2 Installation: Below grade applications shall receive two coats. Allow 24 hours between coats.

3.3 Reinforcing Method: Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur with no less than 2 plies of felt or glass mat.



SECTION 07197 LAMINATED SHEET VAPOR BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Bonded Multi-Ply Flexible Core Board:

2.1.1 Board with Core Plies of Polyvinyl Chloride shall consist of a core sheet of polyvinyl chloride suspended between two layers of pure-blown, high melt point asphalt and sandwiched between two asphalt saturated felt liners. The felt liners shall be covered with an asphalt weathercoat.

2.1.2 Semi-Rigid Asphalt Board shall consist of an asphalt core sandwiched between two saturated felt liners to which an independent weather-coating is bonded.

2.1.3 Self-Adhesive Multi-Ply Flexible Board shall consist of a 1/16-inch thick waterproof highly flexible elastomeric material with a release paper on one side. The membrane shall be bonded to a reinforcing carrier sheet, vinyl center sheet, additional bitumen, and a protective weathercoating.

2.2 Bonding Agent:

2.2.1 Hot Asphalt for bonding to vertical surfaces or sealing joints shall be a mopping asphalt with a softening point in the range of 180 to 200 F and complying with ASTM D 312, Type III.

2.3 Butt Joint Tape: Elastomeric vapor barrier shall be in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.

3.0 EXECUTION: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.



SECTION 07198 PLASTIC SHEET VAPOR BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Polyethylene Sheet shall comply with ASTM D 2103.

2.2 Butyl Sheet shall be an impermeable butyl rubber membrane 1/16 inch thick having a tensile strength per ASTM D 412 of 1,200 psi minimum and an elongation per ASTM D 412 of 300 percent minimum. Butyl sheet shall be resistant to ozone and remain flexible to 40 degrees F below zero.

2.3 Neoprene Sheet shall be an impermeable, self-extinguishing, ozone-resistant material, 1/16 inch thick. Neoprene shall have a tensile strength per ASTM D 412 of 1,500 psi minimum and an elongation per ASTM D 412 of 250 percent minimum.

2.4 Ethylene Propylene Diene Monomer (EPDM) Sheet shall be an impermeable membrane resistant to ozone and ultra-violet radiation. EPDM shall have a tensile strength per ASTM D 412 of 1,400 psi minimum and a elongation per ASTM D 412 of 300 percent minimum.

2.5 Vinyl Sheet shall be a heavy-duty polyvinyl chloride sheet complying with ASTM D 3083.

2.6 Primers shall be as required.

2.7 Adhesives:

2.7.1 Adhesive for Cold Application shall be a non-setting bitumen cutback asphalt.

2.7.2 Adhesive for Hot Application shall be asphalt complying with ASTM D 312, Type III.

2.8 Butt Joint Tape shall be an elastomeric vapor barrier in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.

3.0 EXECUTION:

3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

3.2 Installation:

3.2.1 Primer: Apply primer by brushing or spraying uniformly over surface to receive membrane.

3.2.2 Membrane:

3.2.2.1 At footings, shape the membrane to conform to the surface.

3.2.2.2 Apply adhesive to both the footing and to the membrane.



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3.2.2.3 On vertical surfaces, apply adhesive to both wall and membrane.

3.2.2.4 Seal joints between adjacent sheets centering 6-inch sealing tape over the joint.



SECTION 07210 BATT AND BLANKET BUILDING INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of batt and blanket building insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mineral Fiber Insulation shall comply with ASTM C 665, Type II.

2.2 Reflective Insulation shall comply with ASTM C 665, Type III.

2.3 Membrane Covering: All vapor permeable back surface coverings, membrane coverings, or facings affixed to insulation in compliance with ASTM E 84 shall have a flame spread rating not greater than 25 and a smoke developed rating not greater than 50 when tested.

2.4 Separately Applied Vapor Barriers:

2.4.1 General: Separate vapor barrier material shall have a permeability of 1.0 perm or less, in compliance with procedure "A" of ASTM E 96.

2.4.2 Ground Cover for Crawl Spaces: Ground cover for crawl space applications shall have a permeability of 0.5 perm or less, in compliance with ASTM E 154.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Separately Applied Vapor Barriers: All surfaces on which separately applied vapor barrier material is to be applied shall be free of any projections that might puncture the vapor barrier material.

3.1.2 Masonry Wall Applications: Provide wood fastening strips for fastening rigid insulation to masonry walls.

3.2 Installation. Install insulation to a thickness necessary to provide the designated or directed R-value.

3.2.1 Exterior Walls:

3.2.1.1 Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.

3.2.1.2 Install Insulation having an affixed facing with the facing toward the interior (warm-in-winter) side of the construction.



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3.2.1.3 Install Reflective Insulation with an air space of not less than 3/4 inch, adjacent to the reflective facing, when insulation thickness permits.

3.2.1.4 Crawl Spaces (Unvented): Contractor shall cut vent openings in exterior walls of crawl spaces, frame as necessary to reinforce the openings, and install wood or aluminum louvers and screening.

3.2.1.5 Crawl Spaces (Vented): Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.

3.2.1.6 Ceiling: Insulate each space between framing members completely with batt or blanket type building insulation, sized to fit the full width of the space. Install insulation around, not over, all recessed lighting fixtures in ceiling construction. Install insulation so as to permit air passage from eave vents to air space above insulation.

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SECTION 07211 LOOSE OR GRANULAR FILL INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of loose or granular fill insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mineral Fiber Insulation shall comply with ASTM C764.

2.2 Perlite Insulation shall comply with ASTM C 549, treated for water repellancy.

2.3 Vermiculite Insulation shall comply with ASTM C 516, Type II, treated for water repellancy.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Cavity Applications: Close off all openings in cavities to receive loose or granular fill insulation, except at the top so as to permanently prevent insulation from escaping.

3.1.2 Ceiling Applications: Wherever loose or granular fill insulation is to be applied over dropped soffit or other large cavities exposed to the attic, install fiberboard or other suitable material between framing members over soffit cavity to support insulation.

3.2 Installation:

3.2.1 Install insulation to a thickness necessary to provide the designated R-value.

3.2.2 Install insulation to completely fill all required ceiling and horizontal areas.



SECTION 07212 RIGID INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rigid insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mineral Fiberboard Insulation shall comply with Fed. Spec. HH-I-558, Form A, class as specified.

2.2 Polystyrene Plastic Board Insulation shall comply with ASTM C 578, Type II.

2.3 Urethane Plastic Board Insulation shall comply with ASTM C 591.

2.4 Cellular Glass Block Insulation shall comply with ASTM C 552, Type I.

2.5 Organic Fiberboard Insulation shall comply with ASTM C 208. Organic Fiberboard Insulation shall be chemically treated to resist decay, fungus growth, and insect attack.

2.6 Corkboard Insulation shall comply with ASTM C 640.

2.7 Glass Fiberboard Insulation shall comply with Mil. Spec. MIL-I-742.

3.0 EXECUTION:

3.1 Preparation: All surfaces to which rigid insulation will be mastic-mounted shall be free from all materials that will prevent proper adhesion.

3.2 Installation: Install insulation to a thickness necessary to provide the designated R-value.

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Section 07213 Perimeter Insulation

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of perimeter insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Polystyrene Insulation Board shall comply with ASTM C 578, Type I.

2.2 Urethane Insulation Board shall comply with ASTM C 591. Urethane insulation board shall have a minimum density of 1.7 pounds per cubic foot.

2.3 Insulation Thickness shall be 1 inch, except where otherwise specified or directed.

2.4 Surface Burning Characteristics: Insulation shall have a maximum flame spread index of 25, in compliance with ASTM E 84.

2.5 Plastic Cement shall comply with Fed. Spec. SS-C-153.

2.6 Asphalt-Saturated Felts shall comply with ASTM D 226, Type I.

2.7 Adhesive or Mastic for bonding insulation shall comply with applicable fire-resistance requirements for the insulation being installed.

3.0 EXECUTION:

3.1 Preparation: The Contractor shall remove all materials and construction necessary to gain access to the work.

3.2 Installation: Apply insulation to the full thickness required over the entire area to be insulated.

3.3 Reconstruction: Restore existing slabs, construction, and finishes that have been removed for the installation of insulation or damaged to their original condition.

3.4 Restoration of Landscaping: Restore landscaping that is disturbed to its original condition.



SECTION 07215 SPRAYED-ON INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Urethane Foamed-in-Place Insulation shall be a spray-applied two-component material that when mixed together in proper proportions produces a rigid closed cell foam material.

2.1.1 Physical Properties of cured foam shall be as follows:

2.1.1.1 Nominal Density shall be 1.5 to 2.5 lbs/cu ft (ASTM D 1622).

2.1.1.2 Closed Cell Content shall be 90 percent minimum.

2.1.1.3 Compressive Strength, parallel to rise, shall be 40 psi.

2.1.1.4 Thermal Conductivity (k factor) Btuh/psf/F/in. shall be 0.17 when aged 90 days at 14 F dry heat (ASTM C 518).

2.1.1.5 Vapor Transmission shall be 3.0 perm-inch.

2.1.1.6 Water Absorption shall be 3.0 percent.

3.0 EXECUTION:

3.1 Substrates shall be cleaned prior to application of sprayed-on insulation.

3.2 Openings in Roofs to receive foamed-in-place insulation shall be closed sufficiently to prevent escape of insulation.

3.3 Protect Installed Insulation from harmful weather exposures and possible physical abuses including fire hazards.



SECTION 07223 ROOF INSULATION AND UNDERLAYMENT CELLULAR GLASS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cellular glass. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cellular Glass Block Insulation: ASTM C 552, Type I, rigid, closed cell, noncombustible, foamed glass blocks. Sizes shall be manufacturer's standard sizes and required thickness, edges square.

2.2 Cellular Glass Board Insulation: ASTM C 552, Type IV, rigid, closed cell, noncombustible, foamed glass boards, with laminated kraft paper faces.

2.2.1 Board Sizes: Manufacturer's standard sizes and required thickness with 1/4-inch bevel on long edges at bottom of board.

2.2.2 Tapered Unit Sizes: Manufacturer's standard sizes and taper.

2.2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.3 UL Listing: Cellular glass roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Cellular glass roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.4 FM Listing: Cellular glass roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Cellular glass roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Installation: Place beveled edge of board units to the deck surface in same direction continuously throughout each course.

3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.



Section 07224 Roof Insulation And Underlayment - Mineral Fiber

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mineral fiber. Products shall match existing material and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Insulation board shall be Fed. Spec. HH-I-526, rigid inorganic fiberboard formed with fillers and water-resistant binders.

2.1 Glass Fiberboard: Mineral fiber insulation boards formed of glass fibers shall be bonded together with asphalt and surfaced on top surface with glass-fiber reinforced asphalt mat.

2.2 Mineral Fiberboard: Mineral fiber insulation boards formed of rock or slag processed into fiber shall be bonded together with asphalt and surfaced on top surface with asphalt saturated felt.

2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.4 UL Listing: Mineral fiber roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Mineral fiber roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.5 FM Listing: Mineral fiber roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Mineral fiber roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION: Install insulation to a thickness necessary to provide the designated R-value.



Section 07225 Roof Insulation And Underlayment - Composite Board

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composite board. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Composite Board Insulation shall consist of two insulation boards chemically bonded together. Top board shall be expanded rigid polyurethane foam board complying with ASTM C 984; top surface shall be surfaced with one layer of asphalt saturated felt or glass fiber mat. Second layer shall be one of the following materials:

2.1.1 Inorganic Perlite Mineral Aggregate Board: ASTM C 728.

2.1.2 Inorganic Glass Fiberboard: Fed. Spec. HH-I-526.

2.1.3 Mineral Fiberboard: ASTM C 726.

2.2 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.3 Edge Sealant: Mastic sealant of type recommended by insulation manufacturer.

2.4 UL Listing: Composite board roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Composite board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.5 FM Listing: Composite board roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Composite board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Installation: Install composite insulation boards with urethane surface up.

3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.



SECTION 07226 ROOF INSULATION AND UNDERLAYMENT EXPANDED PERLITE BOARD

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of expanded perlite board. Products shall match existing material and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 **PRODUCTS:**

2.1 **General:** Board shall be ASTM C 728, rigid, noncombustible board formed of expanded perlite aggregate and fibers combined with water-resistant mineral binders. Boards shall have integral top surface coating of insulation manufacturer's standard type.

2.2 **Flame Spread Rating:** Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.3 **UL Listing:** Expanded perlite board roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Expanded perlite board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.4 **FM Listing:** Expanded perlite board roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Expanded perlite board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 **EXECUTION:**

3.1 **Insulation Board** shall be covered with wood board walkways where transport of materials will result in damage to the insulation. Remove walkways ahead of roofing operations.

3.2 **Insulation** shall be installed to a thickness necessary to provide the designated R-value.

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SECTION 07227 ROOF INSULATION AND UNDERLAYMENT FIBERBOARD

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of fiberboard. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: ASTM C 208, Rigid, organic fiberboard derived from wood, cane, or other vegetable fibers, formed with fillers and water-resistant binders.

2.2 Asphalt Impregnation: Insulation board shall be impregnated with asphalt, applied at rate not to exceed 4 percent by weight.

2.3 Bituminous Coating: Insulation board shall be surfaced with manufacturer's standard bituminous coating.

2.4 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.5 UL Listing: Fiberboard roof insulation and underlayment materials of roofing systems that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Fiberboard board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.6 FM Listing: Fiberboard roof insulation and underlayment materials of roofing systems that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Fiberboard board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 **EXECUTION:** Install insulation to a thickness necessary to provide the designated R-value.



SECTION 07256 SPRAYED-ON FIREPROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on fireproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Products shall be provided that have been tested in accordance with ASTM E 119, UL 263, ANSI A2.1, or NFPA 251 for fire-resistance and rated by UL or other industry-recognized agency for the required resistances.

2.1 Spray-Applied Fireproofing: Materials shall conform to the requirements of ASTM E 1042, Type I, Category A. Spray-applied fireproofing materials shall not contain asbestos.

2.1.1 Water shall be clean, fresh, potable, and free from amounts of oils, acids, alkalies, and organic matter that would be injurious to the fireproofing.

2.2 Performance Requirements: Spray-applied fireproofing material shall conform to the following requirements:

2.2.1 Deflection: Spray-applied fireproofing shall not crack, spall, or delaminate when tested in accordance with ASTM E 759.

2.2.2 Cohesion/Adhesion: Spray-applied fireproofing material shall have a minimum cohesive/adhesive force of 80 psf when tested in accordance with ASTM E 736.

2.2.3 Bond-Impact: Spray-applied fireproofing material shall not crack, spall, or delaminate when tested in accordance with ASTM E 760.

2.2.4 Compressive Strength: The minimum compressive strength shall be 500 psf based upon the average load of 10 percent deformation or at ultimate load, whichever is less as tested in accordance with ASTM E 761.

2.2.5 Air Erosion: Gain in weight of the collecting filter shall not exceed 0.025 gram per square foot when tested in accordance with ASTM E 859.

2.2.6 Corrosion Resistance: No evidence of corrosion, after testing in accordance with ASTM E 937, for metal surfaces to be covered.

2.3 Fire Hazard Classification:

2.3.1 Surface Burning Characteristics: Spray-applied fire-proofing material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less, and a fuel contributed rating of 50 or less when tested in accordance with ASTM E 84.

2.4 Fire Resistance Rating for building elements shall be as indicated and shall conform to the fire rated assemblies as listed in the UL Fire Resistance Directory.

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2.5 Substrate Primers: Provide type that is compatible with condition of each substrate to be fireproofed, including shop primers applied by metal fabricators/erectors, and is compatible with bonding adhesives and fireproofing materials.

2.6 Metal Lath: Except as otherwise indicated, provide 3.4-pound (per sq yd) expanded galvanized diamond steel lath, with reinforcing members and clips and other anchorage devices as appropriate for substrate and complying with selection requirements of applicable fire endurance tests. Provide corner beads and other lathing accessories of standard design and weight, where required.

3.0 EXECUTION:

3.1 Surface Preparation: Surfaces to be fireproofed shall be thoroughly cleaned of all dirt, grease, oil, paint, rust, and mill scale or other contaminants that will interfere with the proper bonding of the sprayed fireproofing to the substrate. Ceiling areas to be fireproofed shall be cleared of all obstructions interfering with the uniform application of the spray-applied fireproofing. Hardware such as support sleeves, inserts, clips, hanger attachment devices and the like shall be installed prior to the application of the fireproofing.

3.2 Surface Acceptability: Surfaces to receive sprayed fireproofing shall be inspected prior to application of fireproofing material and certified to be clean and in acceptable condition for application of spray-applied fireproofing.

3.3 Application: Prior to spray application, surfaces not to receive spray-applied fireproofing, including instruments, gauges, and equipment shall be covered to prevent contamination by splatter, rebound, and overspray. Exterior openings in areas to receive spray-applied fireproofing shall be covered prior to and during application of fireproofing with tarpaulins or other approved material. Fireproofing material shall be applied to a thickness as required to obtain the specified fire resistance rating and to provide a fire-protective coating of uniform density and texture. Fireproofing shall be applied in accordance with the procedure recommended by the manufacturer. Fireproofing applied to underside of steel roof deck or steel floor assemblies shall be installed only after respective roof or floor construction is complete. No roof or floor traffic shall be allowed during application and during curing period. Sealer shall be applied to clean, dry fireproofed surfaces in accordance with manufacturer's recommendations.

3.4 Cleanup: Surfaces not indicated to receive fireproofing shall be thoroughly cleaned of all sprayed material.



SECTION 07310 STEEL SHINGLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel shingles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Delivery, storage and handling, of steel shingle cartons shall be kept in a dry place and stacked as shipped. Shingles shall be delivered to site in manufacturer's sealed and undamaged containers, clearly marked with manufacturer's brand, name, and UL classification marking.

2.0 Products:

2.1 Shingles shall meet the following requirements; Performance Properties: UL-997 Wind Resistance, UL-1897 Uplift Resistance, UL-790 Fire Resistance, UL-2218 Hail/Impact Resistance, FM-4470 Foot Traffic/Hail Resistance, PA 201-94 Impact Resistance, PA 100-95 Wind Driven Rain Resistance, ICBO AC07-R1-0797 Penetration Resistance, ASTM-B117 Salt Fog Corrosion Resistance, ASTM-G26 Accelerated UV Resistance, ASTM-A90-95 Galvanization Performance, ASTM G23 Accelerated UV and Humidity Resistance. Coatings Performance Properties: ASTM D 3361 Accelerated Weathering, ASTM G 53 (QUV), ASTM B 117 Salt Spray, ASTM D 2247 Humidity, ASTM D 4145 Formability, ASTM D 522 (Elongation over 1/8" Cylindrical Mandrel), ASTM D 3363 Pencil Hardness, ASTM D 523 Specular Gloss, ASTM D 2794 Reverse Impact, ASTM E 84 Flame Test.

2.2 Nails, screws and rivets used shall be galvanized or stainless steel. A minimum length of nails is 1-1/2", but in a roof over, the nail must penetrate the deck by at least 3/4 inch. Nails are to be 11 or 12 gauge corrosion-resistant roofing nails with 3/8" heads. All field formed flashing shall be painted galvanized steel. All flashing must have a minimum 3" overlap and sealant must be applied at overlaps.

2.3 Sheathing on 24" centers, sheathing shall not be less than 5/8" and on 16" centers, sheathing shall not be less than 1/2"

2.4 Steel shingles shall be manufactured of painted, G90 galvanized steel including five (5) or six (6) formed simulated shingle sections of various widths and depths. Each steel shingle shall lock on all four (4) edges to provide for mechanical connection to adjacent shingle exterior. Paint finish will be one of manufacturer's standard shingle colors and the interior will be painted with a primer and wash-coat.

2.5 Shingles shall be of the following dimensions; overall width 39-3/4", overall length 12-5/8", exposed area 3.28 sq. ft. (39-3/8"x 12") weight per shingle 2.1lbs, weight per square 64lbs. Thickness – shingle and accessory material = nominal 0.0135", including G90 galvanize and paint coatings. Thickness – clip material = nominal 0.015" thickness, G90 galvanized. Paint Coating- shingle and accessories shall be manufactured using coated G90 galvanized steel. 1- Exterior finish; fluoropolymer (PVDF) with anti-corrosion primer, total 1.0 mil dry film thickness. 2- Interior finish; wash-coat with anti-corrosion primer, total 6 mil dry film thickness. Shingle coverage; shingles shall be manufactured and boxed 30 panels per carton, and 98.4 sq. ft. to a carton. Shingle accessories; Ridge/Hip, Starter/Eaves, Gable/Rake, Valley Pan and all other required accessories recommended by manufacturer.

2.6 Underlayment; 15lbs, 30lbs asphalt-saturated organic felt, shall comply with ASTM D 226.

3.0 Execution:

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3.1 Preparation: The minimum required slope is 4:12. Prior to the installation of steel shingles, new and or existing roof deck must be inspected for signs of rotting or warping and corrective actions must be taken as required. Roof over: Loose, curled, broken or lifted existing shingles shall be nailed down or replaced, if required, to provide a solid nailing base. Protruding or loose nails shall be removed or nailed down. New roof: The construction of any bay or section of roof decking shall be completed before roofing work is started. Surfaces shall be smooth, firm, dry and free from loose boards, large cracks and projecting ends that might damage the roofing. Vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven firmly home.

3.2 Installation:

3.2.1. All steel shingles and accessories are to be installed in strict accordance to manufacturer's recommendations.

3.2.2. Sheet metal standards: all detailed work demands meticulous consideration, applying proper sheet metal cutting and folding fundamentals. It is important to consider water flow and overlying materials in proper sequence.

3.2.3. UL Class "A" Fire Rated Roof: for roof applications requiring Underwriters Laboratories, Inc. Class "A" fire-rated roof, the entire roof area must be covered with 1/4" density board. The density board is to be applied directly over the sheathing or existing roof and underneath the underlayment. The density board shall have the joints staggered a minimum of 6", both horizontally and vertically from the sheathing, and shall be fastened with a minimum of six (6) roofing nails per 4'x 8' sheet or more as required to hold the density board in place. Roof shingle fasteners must be long enough to sufficiently penetrate the roof sheathing.

3.2.4. UL Class "A" with existing asphalt shingles: a 5/8"(min.) thick plywood decking shall be used with existing Class "A" asphalt glass fiber mat shingles in roof applications requiring Underwriters Laboratories Inc. Class "A" asphalt shingles.

3.2.5. UL Class "C" Fire-Rated Roof: a 5/8"(min.) sheathing and one layer of Type 30 felt underlayment shall be used in roof applications requiring Underwriters Laboratories, Inc. Class "C" fire-rated roof.

3.2.6. Underlayment: the entire roof shall be covered (prior to shingle application) with 30lbs. felt paper or equivalent. (double layer required at eaves and valleys.) All overlaps are to be 8" horizontal and vertical.

3.2.7. Ice and Water Shield: where there is a possibility of ice forming along eaves or in valleys causing a backup of water, an ice shield that consists of self-adhering polymer modified bitumen sheet, shall be used in lieu of the bottom layer of underlayment. It shall extend from the eaves edge to a point at least 24" inside the exterior wall line of the building and along the entire length of the valley, 24" back from centerline.



Section 07311 Asphalt Shingles

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt shingles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Nails shall be nonferrous metal or zinc-coated steel long enough to penetrate at least 3/4 inch into the deck sheathing.

2.2 Roll Roofing:

2.2.1 Smooth Surfaced: ASTM D 224, Type II.

2.2.2 Mineral Surfaced: ASTM D 225 and provided with 2-inch selvage.

2.3 Shingles shall meet requirements of Underwriters' Laboratories, Inc., for Class C wind-resistant shingles by equaling or exceeding the requirements of UL 55A and UL 997. Shingles shall be square-butt strips of uniform thickness or of thick-butt style, 12 by 36 inches, and either 2-tab or 3-tab design.

2.4 UL Listing: Asphalt shingle materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Asphalt shingle materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.5 FM Listing: Asphalt shingle materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Asphalt shingle materials bearing FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Preparation: Loose, curled, broken, or lifted asphalt shingles shall be nailed down or replaced, if required, to provide a solid nailing base. Protruding or loose nails shall be removed or nailed down.

3.2 Installation:

3.2.1 Application of Roofing When Existing Roofing is Removed:

3.2.1.1 Underlayment: Apply one layer of 15-pound asphalt-saturated felt to roof-deck sheathing.

3.2.1.2 Underlayment: Apply two layers of 15-pound asphalt-saturated felt applied to roof-deck sheathing. A solid coating of bituminous cement shall be applied between the layers of underlayment.

3.2.1.3 Shingles: Apply shingles over underlayment allowing 5-inch butt exposure, and in no case shall there be less than 2-inch head lap. **3.2.1.4 Hips and Ridges** shall be formed with 9- by 12-inch individual shingles.

3.2.1.5 Valleys:

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3.2.1.5.1 Closed Woven-Shingle Valleys shall have a single-layer lining of smooth-surfaced or mineral-surfaced roll roofing, 36 inches wide.

3.2.1.5.2 Roll Roofing Valley shall be two thicknesses of mineral-surfaced roll roofing.

3.2.2 Application of Roofing Over Existing Asphalt Shingles: Shingles shall be applied over old shingles with butt exposure, except for starter course, equal to old shingles, and in no case shall there be less than 2-inch head lap.

3.2.3 Roof Patching and Replacement: Match existing shingles in design, weight, texture, pattern, and color.



SECTION 07314 SLATE SHINGLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of slate shingles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Nails shall be large head slater's nails, either hard copper wire nails, cut copper, cut brass, or yellow metal and shall be long enough to penetrate at least 1 inch into the deck sheathing.

2.2 Slate Shingles shall comply with ASTM C 406 and shall be of matching or designated size, thickness, color, and texture.

2.3 Asphalt-Saturated Organic Felt shall comply with ASTM D 226.

3.0 EXECUTION:

3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.

3.2 Slating:

3.2.1 Starter Course: Apply starter course at eave on cornice line with same thickness slate as main roofing material. Slate shall be approximately 3 inches longer than exposure of first course and shall be installed over a 1/4-inch thick treated wood cant.

3.2.2 First and Succeeding Courses: Apply slate over underlayment with 6-1/2 inch butt exposure with minimum 3-inch head lap. Slate shall project 1 inch at eaves and 1/2 inch at gable ends. Each course shall break joints with preceding course by minimum 3 inches.

3.2.3 Nailing: Fasten each slate with two nails. Do not drive far enough to produce a strain on the slate. Exposed nails shall be permissible only in top courses where unavoidable, and exposed nail heads shall be covered with bituminous cement.



SECTION 07321 CLAY ROOFING TILES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of clay roofing tiles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mortar: Mixture of Portland cement, sand, and pigment.

2.2 Nails: Copper or noncorrosive metal.

2.2.1 Ring Type Nails: Used on plywood sheathing.

2.2.2 Slater's Nails: Minimum of 1-1/2 inches long and shall be used on board sheathing.

2.3 Asphalt-Saturated Organic Felt shall comply with ASTM D 226.

2.4 Roofing Tiles shall be a clay or shale product that is burned to a hard dense structure, glazed or nonglazed on exposed surfaces.

3.0 EXECUTION:

3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.

3.2 Application of Slab Shingle Tiles: Install a 3/4-inch by 1-inch cant strip along eave. On top of cant install under-eave tiles, projecting 1 inch over the rear edge of gutter and flush with the gable edge. Install first course of roofing tiles flush with butt edge of under-eave tile and extend 2 inches over the gable ends. Lay field tiles in straight courses with 2-inch head lap and secure with roofing nails in all holes provided in tiles. Lay all tiles within one foot of hips, ridges, and abutting vertical surfaces in bituminous cement.

3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant or under-eave fitting, install first course of roofing tiles projecting 1 inch over rear edge of gutter. Lay roof tiles with straight butt lines, interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in tiles. Provide gable rake fittings at all gables.

3.4 Application of Spanish and Mission Tiles: Install cant strip over eave closure fittings and nailing strips as required by configuration of tiles. Set eave closures back 2 inches from lower edge of eave. Lay tiles in straight vertical lines up roof and with uniform exposure to weather. Give all tiles minimum lap of 3 inches, and extend eave tiles 1 inch over edge of gutters. Fit all tiles properly and secure with nails in all holes provided. Nails shall be long enough to penetrate at least 1 inch into wood base. Cement and nail cover tiles to gable rakes with bituminous cement, all the way up the gables. When eave closures and top fixtures are not required, cement eaves and joint at ridge with mortar.

3.5 Replacing Individual Spanish or Mission Roofing Tiles: Remove broken tiles by cutting nails with a ripper. Insert new tiles of the same color and size as broken one by troweling Portland cement mortar on new tile surface that will be lapped by tile in course above and on surface that will lap tile in course below. Fasten new tile in place with metal strap or wire.



SECTION 07322 CONCRETE ROOFING TILES

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of concrete roofing tiles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mortar: Mixture of Portland cement, sand, and pigment.

2.2 Nails: Copper or noncorrosive metal.

2.2.1 Ring Type Nails: Used on plywood sheathing.

2.2.2 Slater's Nails: Used on board sheathing.

2.3 Roofing Tiles: Waterproof concrete product reinforced with steel wire. Each tile shall be manufactured with nail holes. Standard rake, closures, hip, and ridge fittings same color as tile, shall be provided.

2.4 Asphalt-Saturated Organic Felt shall comply with ASTM D 226.

3.0 EXECUTION:

3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.

3.2 Application of Slab Shingle Tiles: Apply 1-inch by 1/2-inch cant strip 1/2 inch from edge of eave. On top of cant, install a starter strip of tiles projecting 1 inch over rear edge of gutters and 1 inch beyond gable ends. Install the first course of tiles flush with edges of starter strip. Lay field tiles in straight courses with a 2-inch head lap and secure with two large-head roofing nails. Lay all tiles within 1 foot of hips, ridges, and abutting vertical surfaces in bituminous cement.

3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant, or under-eave fitting, install first course of roof tile projecting 1 inch over the rear edge of gutter. Lay roof tiles with straight butt lines interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in the tiles. Provide gable rake fittings at all gables.



Section 07410 Preformed Roofing And Siding

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of preformed roofing and siding panels. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aluminum Roof Panels: Fabricated from roll-formed panels of aluminum alloy in accordance with ASTM B 209, tempered as required for forming operation, with a minimum thickness of 0.032 inch. Thickness of panels shall be the standard thickness as required for roofing span and design loading.

2.1.1 Color-Coated Finish. One of the following standard factory-applied, baked-on coatings:

2.1.1.1 Acrylic Enamel Coating: Epoxy primer and acrylic enamel top coat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat.

2.1.1.2 Fluoropolymer Coating: Full strength 70 percent polyvinylidene fluoride finish, dry film thickness not less than 1.0 mil over a minimum 0.2 mil baked-on modified epoxy primer.

2.1.1.3 Siliconized Polyester Coating: Epoxy primer and silicone-modified polyester enamel topcoat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat.

2.1.2 Factory Prime Coating: Factory-applied baked-on epoxy primer coat, not less than 0.2 mil dry film thickness applied after pretreatment.

2.1.3 Natural Finish: Stucco embossed finish, plain mill-finished or special alloy-clad sheet (Alclad), as required.

2.1.4 Corrugated Panels shall be standard 7/8 inch deep with corrugation crests at 2.67 inches on centers with either interlocking ribs or overlapping side laps at side joints, as required.

2.1.5 V-Beam Panels shall be standard V-shaped ribbed panels, nominally 4-7/8 inches on centers and 1-3/4 inches deep with either interlocking ribs or overlapping side laps at side joints, as required.

2.2 Steel Roof Panels shall be factory-painted steel metal panels which shall be zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating designation. Roof covering shall be 22 galvanized sheet gauge or thicker. Steel roof panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.

2.2.1 Corrugated Panels shall have similar dimensional and side joint characteristics as specified for aluminum roof panels.

2.2.2 Box Rib Panels shall be standard units, approximately 1-1/2 inches deep with 1-3/8 inch wide flutes and 5 box ribs at 7-13/64 inches on centers for a 36-inch wide coverage.

2.2.3 Four-Inch Ribbed Panels shall be standard units approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.

2.3 Standing Seam Roofing:



2.3.1 General: Roof-covering panels shall be fabricated of zinc-coated steel conforming to ASTM A 446, G90 coating designation or aluminum-coated steel conforming to ASTM A 463, Type 2. Roof covering shall be 24 galvanized sheet gauge or thicker. Panels shall have configurations designed for mechanically formed lock seams for securing adjacent sheets. Sealant for standing seams shall be factory-applied. Width of sheets shall provide not less than 12 inches of coverage in place. Height of standing seam shall be not less than 2-1/2 inches for slopes less than 3 inches in 12 inches, and not less than 1-3/4 inches for slopes 3 inches in 12 inches or greater.

2.3.2 Color Coating: Color finish shall consist of either a synthetic resin base coating applied to a pretreated and primed surface or a dry film coating material bonded to the metal substrate with adhesive. Dry film thickness of color coat shall be not less than 0.8 mil for exterior surface finish.

2.3.3 Accessories shall include flashing, trim, caps, and similar accessories of not less than the minimum thicknesses specified for roofing. Accessories of zinc-coated steel used with aluminum-coated steel shall be painted. Molded closure strips shall be closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configuration of the covering.

2.3.4 Panel Clips shall be of two-piece construction with movable tabs. Clips shall provide for at least 2 inches of panel movement. Tabs shall be designed to be folded into the lock seam.

2.3.5 Fasteners shall be zinc-coated steel or corrosion-resisting steel.

2.3.5.1 Screws shall be not less than No. 14 diameter if self-tapping type and not less than No. 12 diameter if self-drilling and self-tapping type.

2.3.5.2 Blind Rivets shall be stainless steel.

2.3.5.3 Bolts shall be not less than 1/4-inch diameter, shouldered or plain shank, as required, with proper nuts.

2.4 Aluminized Steel Roof Panels:

2.4.1 General: Roof panels shall be formed of Type II aluminized sheet in accordance with ASTM A 463. Thickness shall be not less than 22-gauge material.

2.4.2 Aluminized steel corrugated panels shall be similar to standard profiles and dimensional and side joint characteristics as specified for aluminum roof panels and steel roof panels.

2.5 Plastic Roof Panels:

2.5.1 General: Preformed translucent plastic roof panels shall be glass fiber-reinforced polyester plastic panels conforming to ASTM D 3841.

2.5.2 Non-Fire Rated Translucent Plastic Roof Panels shall be manufactured of acrylic modified resins with either a smooth or embossed finish. Glass reinforcement shall be not less than 27 percent by weight and resins approximately 73 percent by weight and shall be of high quality light-stabilized polyester, modified with acrylic monomer.

2.5.3 Low Flame Spread Translucent Plastic Roof Panels shall be manufactured of light-stabilized, fire-retardant polyester approximately 75 percent by weight and modified with acrylic monomer. Glass reinforcement shall be not less than 25 percent by weight. Panels shall be classified by Underwriters'

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Laboratory with a flame spread of not greater than 25 when tested in accordance with ASTM E 84. Finish shall be smooth or embossed as required.

2.5.4 Corrosion-Resistant Opaque Panels shall be manufactured of resins composed of high quality light-stabilized polyester, modified with acrylic monomer. Where required, panels shall be the fire-retardant type classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 84.

2.5.5 High Strength Opaque Fire-Retardant Panels suitable for walkable roof service shall be composed of high quality light-stabilized, fire-retardant polyester, modified with acrylic monomer. Glass reinforcement shall be a minimum of 38 percent, composed of woven continuous strand and chopped strand glass. Interior and exterior surfaces shall have a surface veil. Finish shall be embossed. All panels shall be classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 84.

2.6 Aluminum Siding Panels: Aluminum siding panels shall be similar to aluminum roofing panels. Four-inch ribbed panels shall be approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.

2.7 Steel Siding Panels shall be similar to steel roofing panels, including finish and profiles (except box rib profile). Thickness shall be 24 galvanized sheet gauge or thicker.

2.8 Insulated Siding Panels:

2.8.1 Factory-assembled Sandwich Panels:

2.8.1.1 General: Interior and exterior panels shall be shop-assembled, fabricated of hot-dipped, zinc-coated, roll-formed steel sheet, ASTM A 446, Grade A, except where higher strength is required for performance, and G90 zinc coating. Thickness of interior and exterior panels shall be determined for wall spans and design loading as required.

2.8.1.2 Insulation shall be standard glass fiber blanket insulation complying with ASTM C 665, Type I, with a k-value of 0.27 at 75 F and a density of not less than 1.5 lbs/cu ft.

2.8.1.3 Assembled Panel System shall have standard continuous gasket at male legs isolating metal-to-metal contact. Panels shall be factory-caulked.

2.8.1.4 All Related Closures, Flashings, and Copings shall be manufactured from same gauge material as exterior face metal panel and shall be properly engineered to job conditions.

2.8.1.5 Finish of Exterior Panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum panels. Finish of interior panels shall be prime coat with a color coat as required.

2.8.2 Field-Assembled Sandwich Panels:

2.8.2.1 Interior Wall Facing Units shall be hot-dipped, zinc-coated, single rib design steel sheet, ASTM A 446, Grade A, G90 zinc coating. Interior wall facing units may be of 0.024 inch or thicker aluminum. Interior units shall be roll-formed in unit widths of 12 inches with 1-1/2 inch ribs or 24 inches with 2-inch ribs. Interlocking joints shall be provided between units. Interior wall units shall present a flush inside wall surface.



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2.8.2.2 Insulation: Rigid or semi-rigid board insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or 2. Blanket insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Insulation shall be of sufficient thickness to provide the designated U-value.

2.8.2.3 Exterior Panel Materials shall be mill-embossed finished aluminum, galvanized steel, galvanized and painted steel, or stainless steel.

2.8.2.3.1 Aluminum Sheets shall be ASTM B 209. Where required, stucco embossed finish shall be provided. Where required, provide Alclad aluminum alloy-clad sheets where exposed without applied coatings.

2.8.2.3.2 Steel Panels shall be metal panels of zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating. Where color coating is required, finish shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.

2.8.2.3.3 Stainless Steel Panels shall be fabricated from ASTM A 167, sheet stock types 302 or 304 stainless steel with No. 2B surface finish. Where exposure to corrosive atmospheres or coastal areas is required, stainless steel panels shall be fabricated from ASTM 167, sheet stock type 316, with No. 2B surface finish.

2.9 Solid Vinyl Siding shall comply with ASTM D 3679, Class 2.

3.0 EXECUTION:

3.1 General: Installation shall include all standard fasteners, flashings, sealants, gaskets, closure strips, trim, and insulation associated with roofing and siding. Provide expansion joints where required.

3.2 Field-Assembled Sandwich Panel Siding shall include installation of subgirts. All panels shall be erected with flutes and ribs running vertically.

3.3 Factory-Assembled Sandwich Panels shall be erected by means of standard concealed clip attachments.

3.4 Solid Vinyl Siding shall include all accessories required for a complete installation.



Section 07463 Asbestos Cement Roofing And Siding

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asbestos cement roofing and siding. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wall Covering and Roof Covering: Corrugated asbestos cement panels shall conform to ASTM C 221, Type A, natural gray color.

2.2 Accessories: Accessories of asbestos cement used as supplementary or finishing pieces shall conform to ASTM C 221. Molded closure strips shall be bituminous saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match the configuration of the covering.

2.3 Fasteners: Fasteners exposed to weather shall be gasketed or have gasketed washers to weatherproof the penetration. Gaskets shall be neoprene, other elastomeric material, or lead approximately 1/8 inch thick. Bolts and drive screws shall be zinc-plated steel. Self-tapping screws shall be cadmium-coated or 300 series corrosion-resisting steel. Bolt clips shall be galvanized steel of standard design appropriate for the application.

2.4 Insulation Materials: Insulation shall be of sufficient thickness to provide the designated roof and wall U-values through the completed construction, when determined for winter conditions in accordance with recognized methods in agreement with the ASHRAE Handbook & Product Directory, Fundamentals. Insulation shall have a facing providing a permeability as required when tested in accordance with ASTM E 96. Facing shall be either of reinforced foil with a vinyl finish or sheet vinyl, except unreinforced foil may be used in concealed locations. Facings and finishes shall be factory-applied. Insulation, including facings and finishes, shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84.

2.4.1 Rigid or Semi-Rigid Board Insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or Class 2. Exposed insulation shall have a white non-dusting and non-shedding finish.

2.4.2 Blanket Insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6.

2.5 Insulation Retainers: Insulation retainers shall be type, size, and design necessary to hold the insulation adequately. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

2.6 Wall Liners: Wall liners shall be 0.024-inch or thicker aluminum or 26 galvanized sheet gauge or thicker steel. Wall liners shall be formed or patterned to prevent waviness and distortion and shall extend from the floor to height as required. Matching metal trim shall be provided at the base of wall lining, top of wall liner, around openings in walls and roof and over interior and exterior corners.

2.6.1 Steel Wall Liners shall be zinc-coated steel conforming to ASTM A 446, G 90 coating designation, or aluminum-coated steel conforming to ASTM A 463, Type 2.

2.6.2 Aluminum Wall Liners shall conform to ASTM B 209, temper as required for the forming operation.



2.6.3 Sealant shall be as recommended by the roofing and siding manufacturer.

3.0 EXECUTION:

3.1 Wall Covering and Roof Covering: Sheets shall be laid the straight or staggered joint method as required. Wall covering shall be applied with edge corrugations turned in and the longitudinal configurations in the vertical position. Roof covering shall be applied with the edge corrugations turned down and the longitudinal configurations in the direction of the roof slope. End laps shall be made over framing members with fasteners into framing members approximately 3 inches from the end of the overlapping sheet. Side laps and end laps of roof and wall covering and joints at accessories shall be sealed. Holes for fasteners shall be drilled only in the high part of the corrugation. Fasteners shall be driven normal to the surface and to a depth to seat the gasketed washers properly without overdriving and cracking the crests. Automatic end-welded studs shall not be used for applying wall and roof sheets. Cutting of sheets shall be accomplished with a saw equipped with a vacuum or a water jet and in accordance with OSHA 1910.1001 and 1926.103.

3.2 Molded Closure Strips shall be installed wherever covering sheets terminate in open-end configurations, exclusive of flashings.

3.3 Insulation shall be installed between covering and supporting members. Blanket insulation shall have facing at joints lapped and fastened in a manner that will provide tight joints. Exposed rigid or semi-rigid insulation in ceilings shall be fastened securely without loose joints and unsightly sags. Insulation retainers shall be fastened securely in place.

3.4 Wall Liners: Additional framing and accessories shall be provided as necessary for the installation of the wall liners.



Section 07510 Built-Up Roofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of built-up roofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Primer: Asphalt, ASTM D 41; coal-tar, ASTM D 43.

2.2 Bitumen:

2.2.1 Asphalt: ASTM D 312, Type I on slopes from 1/4 inch per foot up to and including 1/2 inch per foot, Type II or Type III on slopes above 1/2 inch per foot up to and including 1 inch per foot, Type III on slopes above 1 inch per foot and including 3 inches per foot.

2.2.2 Coal-Tar Bitumen for slopes from 1/4 inch per foot up to and including 1/2 inch per foot: ASTM D 450, Type III, unless Type I is approved by the Contracting Officer.

2.2.3 Cold-Process Asphalt Emulsion: A mechanical mixture of minute particles of asphalt and special clays suspended in water.

2.3 Cants: Treated fiberboard, ASTM C 208; wood blocking treated with waterborne preservative, AWPB LP-2; or foamglass. Cants shall have maximum 5-1/2 inch face dimensions at a 45 degree incline to roof plane and lengths as long as practical.

2.4 Felt:

2.4.1 Organic-Fiber Felt:

2.4.1.1 Plies: ASTM D 226, Type I, asphalt-saturated; or ASTM D 227, Type I, coal-tar saturated.

2.4.1.2 Asphalt-Saturated Base Sheet: No. 40 felt, ASTM D 2626, Type I or II.

2.4.2 Glass-Fiber Felt:

2.4.2.1 Plies: ASTM D 2178, Type III or IV where average January temperature is above 40 F and Type IV where average January temperature is below 45 F.

2.4.2.2 Asphalt-Impregnated Combination Base Sheet: ASTM D 2178, Type V.

2.4.3 Venting Base Sheet: Asphalt-saturated and coated base sheet with granular surfacing and embossed channels (or grooves) on bottom surface.

2.4.4 Cold-Process System Felts: Coated organic, glass-fiber, or a combination of both.

2.5 Flashings: Bituminous and sheet metal as required.



2.6 Flashing Cement: Bituminous plastic cement complying with Fed. Spec. SS-C-153, Type I for use with asphalt-saturated felts and Type II for use with coal-tar saturated felts. 2.7 Cold-Process Cement: Solvent-based cement that evaporates slowly in cool damp weather, more rapidly in hot dry weather, and is standard with the cold-process glass-fiber reinforced asphalt emulsion roofing system manufacturer.

2.8 Mastic: Solvent-based mastic that evaporates slowly in cool damp weather, more rapidly in hot dry weather, and is standard with the cold-process mastic roofing system manufacturer.

2.9 Nails and Mechanical Fasteners: Industry standard, noncorrosive material, shape and size required for substrate.

2.10 Surfacing Materials:

2.10.1 Aggregate: Crushed stone, gravel, or crushed slag conforming to ASTM D 1863. Subject to approval, other materials may be used when blended to the grading requirements of ASTM D 1863.

2.10.2 Smooth Surfacing:

2.10.2.1 Fibrated, clay-stabilized, water thinned asphalt emulsion with non-asbestos reinforcing, ASTM D 1227, Type IV (clay-type).

2.10.2.2 Reflective Coating: ASTM D 2824, Type I if non-fibrated, Type II if fibrated.

2.10.3 Mineral Surfacing: Mineral surface cap sheet complying with ASTM D 3909.

2.11 Sheathing Paper: ASTM D 549, 5-pound rosin-sized paper.

2.12 Wood Nailers and Edge Blocking: Non-stress graded wood members, treated with waterborne preservative in compliance with AWFB LP-2. 2.13 Walkway Protection Boards: Mineral surfaced bituminous composition boards, approximately 1/2 inch thick, manufactured specifically for hot bituminous application on built-up roofing as a protection course for foot traffic.

2.14 Roofing Systems:

2.14.1 Nailable Deck, Asphalt/Organic Felt Membrane With Aggregate Surfacing: NRCA Specification Plate No. 31-NAOA, Diagram B for light-weight insulating concrete decks and Diagram A for other nailable decks.

2.14.2 Nailable Deck, Asphalt/Glass-Fiber Felt Membrane:

2.14.2.1 With Aggregate Surfacing: NRCA Specification Plate No. 32-NAGA, Diagram B for lightweight insulating concrete decks and Diagram A for other nailable decks.

2.14.2.2 With Smooth Surfacing: NRCA Specification Plate No. 32-NAGA except for substitution of smooth surfacing for aggregate surfacing.

2.14.2.3 With Mineral Surfacing: NRCA Specification Plate No. 32-NAGA except for deletion of one ply of felt and substitution of mineral surfacing for aggregate surfacing.

2.14.3 Nailable Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 33-NCOA, Diagram B for light-weight insulating concrete decks and Diagram A for other nailable decks.

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2.14.4 Insulated Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 41-IAOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.

2.14.5 Insulated Deck, Asphalt/Glass-Fiber Felt Membrane:

2.14.5.1 With Aggregate Surfacing: NRCA Specification Plate No. 42-IAGA; Diagram B for insulation substrate of composite board, poly-isocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.

2.14.5.2 With Smooth Surfacing: NRCA Specification Plate No. 42-IAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.

2.14.5.3 With Mineral Surfacing: NRCA Specification Plate No. 42-IAGA except for substitution of mineral surfacing for aggregate surfacing.

2.14.6 Insulated Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 43-ICOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.

2.14.7 Concrete Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 51-CAOA, Diagram A or B as directed.

2.14.8 Concrete Deck, Asphalt/Glass-Fiber Felt Membrane:

2.14.8.1 With Aggregate Surfacing: NRCA Specification Plate No. 52-CAGA, Diagram A or B as directed.

2.14.8.2 With Smooth Surfacing: NRCA Specification Plate No. 52-CAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.

2.14.8.3 With Mineral Surfacing: NRCA Specification Plate No. 52-CAGA except for substitution of mineral surfacing for aggregate surfacing.

2.14.9 Concrete Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 53-CCOA; Diagram A or B as directed.

2.14.10 Temporary Roofing: NRCA Specification 10-TR; Diagram TR-N for nailable decks, Diagram TR-C for non-nailable decks (except steel) and Diagram TR-SI for steel decks.

2.14.11 Cold-Process Built-Up Membrane Roofing:

2.14.11.1 Glass-Fiber Reinforced Asphalt Emulsion System: Minimum two layers of coated ply felts with smooth surfacing (asphalt emulsion).

2.14.11.2 Mastic System: Coated ply felts (three plies on slopes less than 1 inch per foot and two plies on slopes greater than 1 inch per foot) embedded into a spray application of mastic with embedded mineral granule surfacing.

2.15 UL Listing: Built-up roofing systems and component materials of roofing systems that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Roof covering materials shall bear the Classification



marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.16 FM Listing: Built-up roofing systems and component materials of roofing systems that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Built-up roofing systems and component materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Mineral Surfaced Cap Sheet: Cut sheet in 12- to 18-foot lengths and leave to flatten prior to application.

3.1.2 Temporary Roofing: Remove temporary roofing completely prior to installation of permanent roofing.

3.1.3 Weather Limitations: Do not apply roofing when it is excessively windy, wet, or when the ambient temperature is less than 40 F.

3.1.4 Heating Bitumen: Asphalt shall not be heated above 475 F. Coal tar shall not be heated above 400 F. Application temperatures shall be measured at the mop bucket and/or mechanical applicator.

3.2 Application:

3.2.1 NRCA-Specified Roofing Systems shall be applied in accordance with the NRCA specifications.

3.2.2 Smooth Surfacing: Glaze-coat entire surface of completed built-up roof membrane with hot mopping of Type III asphalt, applied at same rate and concurrent with interply moppings. Allow asphalt coating to age a minimum of 7 days, then apply top coating of asphalt emulsion at an average rate of 2.5 gallons per square. If roof is to receive reflective coating, it shall be applied promptly after application and initial cure (next day) of emulsion coating at an average rate of 1.25 gallons per square.

3.2.3 Mineral Surfacing: Promptly after completion of ply-sheet membrane (same day where possible), apply one lapped course of cap sheet. Set cap sheet in uniform mopping of same hot bitumen used in ply-sheet courses, at an average rate of 15 lbs per square. Lap ends a minimum of 6 inches.

3.2.4 Cold-Process Roofing Systems:

3.2.4.1 Glass-Fiber Reinforced Asphalt Emulsion: Nail or spot-mop the first ply felt. Apply additional plies with cold-process cement brushed, sprayed, or rolled on at the rate of approximately 1-1/2 gallons per square. If precipitation is expected within 48 hours, a solid mopping of hot asphalt shall be used instead of cold-process cement. Over the base sheet assembly, the asphalt emulsion shall be spray-applied with a three-nozzle gun that has a glass fiber cutter that disperses glass fibers 3/4 inches long into the emulsion as it is spray-applied. Reinforced asphalt emulsion shall be sprayed at the rate of approximately 9 gallons of emulsion and 3 pounds of glass-fiber reinforcement per square. If the roof is designated to receive a reflective coating, it shall be applied as soon as the asphalt emulsion membrane is firm enough to support roof traffic without indentations forming in the film.

3.2.4.2 Mastic System: Embed ply felts in mastic sprayed at a rate of approximately 2-1/2 gallons per square per coat. Embed mineral surfacing in top coat of mastic.

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3.3 Accessories and Flashings: Install flashings as recommended by the NRCA Roofing and Waterproofing Manual and the SMACNA Architectural Sheet Metal Manual. Set walkways in additional pour-coat of hot bitumen after aggregate surfacing of built-up roofing membrane.

3.4 Surface Maintenance of Existing Aggregate Surfaced Roofs:

3.4.1 Preparation: Sweep surface and remove all loose and poorly embedded existing aggregate before applying new surface materials.

3.4.2 Primer: Apply thin coat of asphalt primer over affected areas. Allow to dry thoroughly before applying flood coat.

3.4.3 Flood Coat: Apply hot bitumen of type compatible with existing roofing materials, at a rate of 60 pounds per square for Type III asphalt and 75 pounds per square for coal tar.

3.4.4 Aggregate Surfacing: While bitumen is hot, embed clean surfacing aggregate of type to match existing, applied at a rate of 400 pounds per square for gravel, 300 pounds per square for slag, and 400 pounds per square for crushed stone.

3.5 Maintenance and Repair Patching (Hot-Applied Roofing):

3.5.1 Blisters: Make two cuts at right angles to each other, extending cuts 12 inches beyond edge of defective areas and to substrate surface. Fold back cut areas and allow substrate and membrane to dry. Wet insulation shall be removed and replaced with dry insulation matching the original. When dry, apply solid bitumen mopping over opened area and fold cut sections of membrane into bitumen. Totally embed membrane in bitumen.

3.5.2 Splits: Cut out membrane at least 12 inches on each side and extending 18 to 24 inches on each side and extending 18 to 24 inches beyond each end of split area. Dry lay a 6-inch wide strip of roofing felt, cemented over split area. Apply uniform coat of bitumen over dry felt, extending to embedded aggregate in all directions.

3.5.3 Disintegrated and Damaged Felts: Cut and remove disintegrated, damaged, and loose felts to extent necessary to provide sound materials. Cut out wet felts and allow wet surfaces to completely dry before installing patch materials. Replace removed felts with equal plies of felt. Felts shall be solidly mopped into place in hot bitumen and shingled into existing plies to extent possible.

3.5.4 Additional Plies: Finish defective areas by applying at least two additional plies of roofing felt, embedded in hot bitumen. Extend edges of first ply a minimum of 9 inches beyond affected area on all sides and second ply 18 inches beyond affected area on all sides.



SECTION 07530 SINGLE PLY ROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of single ply roofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Roll Roofing: ASTM D 371, Type II, for mineral surfaced; ASTM D 224, Type II, for smooth surfaced.

2.2 Elastic Sheet Roofing: Elastic sheet material shall be EPDM, hypalon, neoprene, polyvinyl chloride, chlorinated polyethylene, polyisobutylene, or modified bitumen (reinforced or unreinforced), as required. Provide products that are fully compatible with indicated substrates or provide separation materials as required to eliminate contact between incompatible materials. The elastic sheet roofing shall meet the following requirements based on type of installation.

2.2.1 For Loose-Laid Ballasted System: Manufacturer's standard thickness but not less than 45 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent elongation (ASTM D 412), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746).

2.2.2 For Mechanically Fastened System: Manufacturer's standard thickness but not less than 60 mils, 1,600 psi minimum tensile strength (ASTM D 412), minimum tear resistance of 150 lbs/lin in (ASTM D 624), 300 percent elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746), standard color.

2.2.3 For Fully Adhered System: Manufacturer's standard thickness but not less than 60 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent minimum elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746), standard or special color, as required.

2.3 Fluid-Applied Roofing: Fluid-applied materials shall be sprayed-in-place urethane roofing with two-coat elastomeric silicone rubber protective coating.

2.3.1 Urethane Foam:

PROPERTY	ASTM TEST METHOD		VALUE
Density, pcf overall	D 1622	2.5 min., 3.5max.	
Compressive Strength psi parallel to rise	D 1621	40.0 min.	
Thermal Conductivity (k factor) Btu/hr/ sq ft/degrees F/in.	C 177	new 0.11 max. aged 0.15 max. (6 months)	

2.3.2 Elastomeric Protective Coating: Two-coat silicone rubber system, bonded to urethane foam:

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PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, psi	D 412	500-600
Elongation, percent	D 412	100-150
Hardness	D 2240	45

2.4 Roofing Installation Accessories:

2.4.1 Roll Roofing:

2.4.1.1 Roofing Nails shall be 12-gauge galvanized with minimum 3/8-inch diameter head and 7/8-inch long shank.

2.4.1.2 Cement shall be cold process asphalt as recommended by material manufacturer.

2.4.2 Elastic Sheet Roofing:

2.4.2.1 Ballast for Loose-Laid Ballasted Systems shall be washed round riverbed gravel, ranging in size from 3/4 inch to 1-1/2 inches in diameter.

2.4.2.2 Mechanical Fasteners used with mechanically fastened system shall be screws, nails, battens, accessory components, and adhesives as appropriate for the substrate.

2.4.2.3 Adhesive for Fully Adhered System shall be compatible with substrate and project conditions and formulated to withstand a minimum 60 psf uplift force.

2.4.2.4 Protective Color Coat as required for mechanically fastened and fully adhered systems shall be ozone-resistant, liquid-applied hypalon.

2.4.2.5 Flashing Material shall be compatible with the membrane.

2.4.2.6 Membrane Seaming System shall be of manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges.

2.4.2.7 Cant Strips and Flashing Accessories shall be compatible with membrane, including adhesive tapes, flashing cements, and sealants.

2.4.2.8 Slip Sheet for protection of membrane from incompatible substrate shall be as recommended by membrane manufacturer.

2.4.2.9 Walkway Protection Boards, where required, shall be prefabricated concrete pavers containing no asphalt or coal-tar derivatives, suitable for use without cracking or breaking.

2.4.3 Fluid-Applied Roofing: Ceramic granules shall be No. 11 screen size dry and free from dust.

2.5 UL Listing: Single ply roofing systems and component materials that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Single ply roof covering materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.



2.6 FM Listing: Single ply roofing systems and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Single ply roofing systems and component materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Roll Roofing: Clean wood deck completely. Ensure that all nails are driven flush with or below deck surface. Surface must be dry before placing any roofing material.

3.1.2 Elastic Sheet Roofing: Clean of dust, debris, or other substances detrimental to work. Remove sharp projections. Prime substrate as required.

3.1.3 Fluid Applied Roofing: Clean all debris from roof surface, new or existing. On existing roof, repair any roof damage to provide a clean smooth surface.

3.2 Installation:

3.2.1 Roll Roofing: Install in accordance with the National Roofing Contractors Association Steep Roofing Manual application instructions.

3.2.2 Elastic Sheet Roofing and Fluid Applied Roofing: Install in accordance with manufacturer's instructions.



SECTION 07550 INVERTED ROOF SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of inverted roof systems. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Primer: ASTM D 41.

2.2 Fiberglass Base Sheet: Glass fiber mat coated with weathering grade asphalt to provide a nonporous ply.

2.3 Fiberglass Felt: ASTM D 2178, Type IV.

2.4 Sheathing Paper: Single-ply 5 lb/100 sq ft, rosin-sized sheathing paper.

2.5 Base for Built-Up Membrane Applied Over Steel Deck shall be one of the following with mechanical attachment:

2.5.1 Mineral Fiberboard: ASTM C 726, 3/4 inch thick.

2.5.2 Wood Fiberboard: Organic fiberboard roof insulation in accordance with ASTM C 208, 1 inch thick.

2.5.3 Gypsum Wallboard: 1/2 inch thick, ASTM C 36.

2.6 Steep Asphalt: ASTM D 312, Type III.

2.7 Extruded Rigid Polystyrene Insulation: ASTM C 578, Type IV, 24-inch by 48-inch standard size, with drainage channel on bottom of each board.

2.8 Galvanized Roofing Nails: 11 gauge, barbed, galvanized with 7/16-inch to 5/8-inch diameter heads or other approved type.

2.9 Fabric for Application Above Insulation: 3 oz/sq yd black polyester or 3 oz/sq yd black polypropylene approved by inverted roof system manufacturer.

2.10 Ballast: Gravel or crushed stone shall be in accordance with ASTM D 448, Gradation No. 57.

2.11 UL Listing: Inverted roof systems and component materials that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Inverted roof systems and component materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.12 FM Listing: Inverted roof systems and component materials that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Inverted roof systems and component materials bearing FM approval



marking on bundle, package, or container indicating the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Installation on Various Deck Materials:

3.1.1 On Lightweight Insulating Concrete Decks, prime concrete surface with asphaltic primer.

3.1.2 On Poured Gypsum Decks, lay one ply of approved fiberglass base sheet with edges lapped and nailed with nails approved for use with gypsum deck materials.

3.1.3 On Precast Concrete Plank Deck or Precast Concrete Tee Deck, prime concrete surfaces with asphalt primer. Prior to applying built-up roof membrane, apply 18-inch wide slip sheet of 2-ply dry-applied fiberglass felt to cover end joints where concrete planks or tees meet.

3.1.4 On Wood Decks, cover the deck with sheathing paper lapping and mechanically fastening each sheet to the deck. Over sheathing paper, apply one ply of approved fiberglass base sheet, lapping joints and nailing, using galvanized roofing nails driven through flat metal disks not less than 1 inch in diameter.

3.2 Builtup Roof Membrane Installation:

3.2.1 Starting at Low Point of Roof, uniformly mop the surface of the nailed fiberglass base sheet or primed deck surface with steep asphalt at the rate recommended for substrate (25 +/- 5 to 30 +/- 5 lbs per square). While hot, embed 3 plies of approved fiberglass felts in shingle fashion, lapping each sheet 24-2/3 inches.

3.2.2 Interply Moppings shall be continuous and applied at the rate listed above for substrate. Complete embedment of felts is required and is accomplished by dragging a broom or squeegee over the felt; no more pressure is required than that exerted by the weight of the "brooming" utensil. During cold weather, effective brooming is essential to eliminate voids and to ensure adhesion. As the work progresses, full mop the top surface of the membrane using a minimum coverage of 25 +/- 5 lbs per square. A second flood coat shall be applied at the rate of 45 lbs per square.

3.2.3 At No Time Shall Felts Be Left Exposed overnight or in inclement weather. All mopping bitumen shall be steep asphalt (Type III, 185-205 F softening point).

3.2.4 Bitumen Temperature at the Kettle shall be controlled so as not to exceed the bitumen manufacturer's recommendations. The roof membrane shall not be staged. Temporary membranes are not acceptable as a part of a completed membrane. Install completed membrane in final form on a day-to-day basis.

3.3 All Flashing shall Be Completed in each area prior to installing roof insulation. Details and installation shall conform to standard inverted roof system specifications.

3.4 Unadhered Insulation Installation:

3.4.1 General: Rigid polystyrene insulation shall be placed on the membrane as the membrane is completed to provide immediate protection. Flood coats of steep asphalt shall be allowed to cool completely prior to rigid insulation installation to ensure unadhered foam.

3.4.2 Rigid Polystyrene Insulation shall be placed directly on membrane with channel side down. End joints shall be staggered and all boards shall be tightly abutted. The maximum acceptable opening between

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boards shall be 3/8 inch. Install insulation to within 3/4 inch of all projections and cant strips. For multilayer installations, install subsequent layers unattached over the unadhered first layer. Stagger all joints in relation to underlying layer. The bottom layer shall be as thick or thicker than the top layer and must be a minimum of 2 inches thick.

3.4.3 Fabric Installation: Place fabric over rigid insulation, unadhered and unattached. Fabric shall be wetted to hold it in place until ballast is installed. Edges shall be overlapped a minimum of 1 foot. Install so that there are no parallel joints within 6 feet of the perimeter. Extend fabric 2 to 3 inches above the stone at perimeter and penetrations.

3.4.4 Thickness of Insulation: Installed thickness shall provide a U-value through completed roof structure, air-to-air, not in excess of that required by job location, as determined for winter conditions in accordance with recognized methods in agreement with ASHRAE Handbook Fundamentals.

3.5 Ballast Installation:

3.5.1 General: Fabric shall be covered with gravel or crushed stone ballast as the fabric is being installed. The stone top covering shall be 3/4 inch with not less than 10 percent nor more than 60 percent of fines smaller than 1/2 inch.

3.5.2 Stone or Gravel Ballast shall be applied at a minimum average rate of 1,000 lbs per square and shall be approximately 1-1/4 inches thick. Around roof perimeter and at penetrations and drains, 20 lbs/sq ft of stone ballast over a 4 foot wide area shall be applied. A continuous row of pavers constituting 22 lbs/lin ft can be substituted for the extra ballast around perimeter, penetrations and drains. Pavers shall be used in high traffic areas near roof and equipment access areas.



Section 07572 Wood Traffic Topping

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Lumber: Standard grade or No. 2 grade, nonstress grade lumber. Lumber and material sizes shall conform to requirements of the rules or standards under which produced.

2.1.1 Species of Nontreated Wood: Walkway members shall be fabricated of cypress or redwood.

2.1.2 Preservative Treated Wood: Walkway members shall be fabricated of preservative treated lumber, treated by pressure method in compliance with AWPB LP-2 and so marked in compliance with AWPB standard. Preservative treated members shall be air-dried or kiln-dried and marked "DRY." Treated wood that is cut after treatment shall be brush-coated with preservative used in original treatment.

2.1.3 Bitumen: Type used in roofing system.

2.1.4 Bituminous Cement: Fed. Spec. SS-C-153, bituminous plastic cement.

2.1.5 Type I: For use with asphalt roofing system.

2.1.6 Type II: For use with coal-tar roofing system.

2.1.7 Premolded Filler Strip: ASTM D 1751, minimum 3/8 inch thick.

2.1.8 Cap Sheet: Fed. Spec. SS-R-630, asphalt saturated roofing felt, coated with strip asphalt both sides and surfaced on weathering side with mineral granules. Cap sheet shall weigh not less than 70 pounds per square.

2.1.9 Prepared Roll Roofing: ASTM D 249, No. 90 asphalt saturated organic fiber felt, coated on both sides with asphalt and surfaced on weathering side with mineral granules.

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SECTION 07573 COMPOSITION TRAFFIC TOPPING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composition traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Composition Panels: ASTM D 517.

2.2 Adhesive: ASTM D 2822, asphaltic roofing cement.

2.3 Bitumen: Type used in roofing system.

3.0 EXECUTION:

3.1 Preparation: Cut panels at the project site only when necessary to obtain sizes of panels different from those furnished.

3.2 Installation:

3.2.1 Spaced Panels: Space panels maximum of 6 inches apart.

3.2.2 Butted Panels: Butt panels together to form continuous walkway areas.



Section 07574 Precast Concrete Or Tile Traffic Topping

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast concrete or tile traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Precast Concrete Tiles:

2.1.1 Compressive Strength: Precast concrete tiles shall have a strength of 3,000 pounds per square inch at 28 days.

2.1.2 Quality Assurance: Absorption shall not exceed 8 percent by weight when tested in compliance with cold water absorption tests specified in ASTM C1195.

2.2 Quarry Tile: ANSI A137.1.

2.3 Drainage Bed: ASTM D 1863, crushed stone, maximum size 1/2 inch.

2.4 Mortar Materials:

2.4.1 Portland Cement: ASTM C 150, Type I, low alkali content.

2.4.2 Sand: ASTM C 144.

2.4.3 Hydrated Lime: ASTM C 207, Type S.

2.4.4 Setting Bed Mortar Mix: One part Portland cement, three parts damp sand.

2.4.5 Pointing Mortar: One part Portland cement, two parts fine graded sand, 1/5 part lime.

2.5 Sealant: ASTM C 920, Grade P, two-component elastomeric type compound.

3.0 EXECUTION:

3.1 Preparation: Prior to installing any roof traffic tiles, coat areas to receive tiles with a solid application of bitumen used in roofing system.

3.2 Installation:

3.2.1 Drainage Bed: In areas to receive traffic roof tiles, install 1-1/2 inch thick drainage bed.

3.2.2 Tiles: Lay tiles in 1-inch thick mortar bed. Provide 3/16-inch to 1/4-inch wide joints between tiles.



SECTION 07605 SHEET METAL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheet metal. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Materials and fabrication shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual. 2.1 Shop- and Job-Fabricated Sheet Metal Items may include the following:

- a. Downspouts with clips, anchors, straps, and leaders.
- b. Edge strip.
- c. Flashings, including base, cap, eave, stepped, valley, apron, collar, through-wall and coping flashings.
- d. Gravel stops and fasciae, extruded or formed.
- e. Gutters, with continuous cleats, hangers, and cover plates.
- f. Louvers.
- g. Pitch pans.
- h. Reglets.
- i. Scuppers.
- j. Splash pans.
- k. Roofing, including batten seam, flat seam, standing seam, and bermuda seam types.

2.2 Aluminum:

2.2.1 Mill Finished Sheets: ASTM B 209, Alloy 3003, temper H14.

2.2.2 Colored Sheets: ASTM B 209, alloy Alclad 3003, temper H14.

2.3 Brass: ASTM B 36, copper alloy No. 260, rolled half-hard temper.

2.4 Copper: ASTM B 370, light cold-rolled temper, mill finish.

2.5 Lead Coated Copper: Cold-rolled sheet copper complying with ASTM B 370, coated with not less than 0.06 pounds per square foot of lead per side. Lead coating shall comply with ASTM B 101, Type I.

2.6 Stainless Steel: ASTM A 167, corrosion-resistant steel, annealed, AISI Type 301, No. 1 finish.

2.7 Copper Clad Stainless Steel: ASTM B 506, stainless steel sheet metal, coated with metallurgically-bonded cladding of copper on each face amounting to 10 percent of thickness (80 percent stainless steel, 20 percent copper). Core shall comply with ASTM A 176, AISI Type 430. Copper cladding shall have mill finish.

2.8 Lead-Coated Copper Clad Stainless Steel: ASTM B 506, copper clad stainless steel sheet metal, coated on one side with 0.06 pounds per square foot of lead complying with ASTM B 101, Type I.

2.9 Terne-Coated Stainless Steel: Stainless steel core complying with ASTM A 167, AISI Type 304, with terne coating of 20 percent tin and 80 percent lead on both faces.

2.10 Terne-Coated Steel: Fed. Spec QQ-T-201, Type 1 commercial quality steel sheet core with 1.45 ounces coating of 20 percent tin and 80 percent lead on both faces.



2.11 Galvanized Steel: ASTM A 526, commercial quality carbon steel sheets with minimum 0.20 percent copper content, hot-dipped galvanized to comply with ASTM A 525, G 90 coating designation. Galvanized steel designated to be finished shall be mill phosphatized and coated with manufacturer's standard baked-on finish.

2.12 Zinc-Alloy: ASTM B 69, containing not less than 0.6 percent copper and 0.14 percent titanium, standard temper.

2.13 Lead Sheet: Fed. Spec. QQ-L-201, Grade B, formed from common desilverized pig lead, complying with ASTM B 29.

2.14 Fasteners:

2.14.1 General Use Fasteners: Same material as sheet metal to which attached, or as recommended by sheet metal manufacturer.

2.14.2 Fasteners for Copper Items: Bronze, brass, or copper types.

2.14.3 Fasteners for Aluminum:

2.14.3.1 Rivets: ASTM B 316, alloy 1100, temper H14, minimum shank diameter of 0.187 inch, length as required to form a head.

2.14.3.2 Screws and Bolts: ASTM B 211, alloy 6061, temper as appropriate for particular use.

2.14.3.3 Washers: Alloy 1100, temper H18 or same aluminum alloy as aluminum sheet or fasteners being used.

2.14.3.4 Noncorrosive Fasteners: Stainless steel, AISI Type 304.

2.14.3.5 Cleats: Formed of same material and thickness as sheet metal being installed, minimum 2 inches wide and long enough to be fully incorporated into work.

2.15 Solder: ASTM B 32, of type best suited for intended purpose.

2.16 Welding Electrodes:

2.16.1 Aluminum: Welding electrodes and filler alloy of type best suited for alloy of aluminum being welded. Paste flux shall be used in welding aluminum.

2.16.2 Stainless Steel: Type recommended by stainless steel producer for type of metal sheet furnished.

2.17 Burning Rods for Lead shall be same composition as lead sheet.

2.18 Miscellaneous Materials:

2.18.1 Felt: ASTM D 226, No. 15 asphalt-saturated organic felt, unperforated.

2.18.2 Sheathing Paper: Rosin-sized paper weighing not less than 6 pounds per square.

2.18.3 Bituminous Plastic Cement: Fed. Spec. SS-C-153, Type I for use with asphaltic roofing materials and Type II for use with coal-tar roofing materials.

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2.18.4 Bituminous Coating: Fed. Spec. TT-C-494, Type II, cold-applied solvent type bituminous mastic coating for application in minimum dry film thickness of 12 mils per coat.

2.18.5 Primer Paint: Fed. Spec. TT-P-645, alkyd type zinc chromate.

2.18.6 Zinc Dust Paint: SSPC PAINT 5 galvanized sheet metal touchup paint.

2.18.7 Sealants: Non-drying mastic type as recommended for particular joint being sealed and anticipated movement within joint. One-part sealant shall be ASTM C 920, Type S, Grade NS, able to withstand an increase and decrease of at least 50% of the joint width as measured at time of application. Two-component sealant shall be ASTM C 920, Type M, Grade NS, also resistant to 50% joint movement.

2.18.8 Wood Nailers and Edge Blocking: Non-stress graded wood members, moisture-resistant, treated with waterborne preservative in compliance with AWPB LP-2 standard. Nominal dimensions of nailers shall be 1 inch by 3 inches, unless otherwise required.

2.18.9 Nonmetallic Through-Wall Flashing: Nonreinforced, homogeneous, waterproof, impermeable elastomeric sheeting having not less than 1,000 psi tensile strength nor more than 7 percent tension set at 50 percent elongation when tested in accordance with ASTM D 412. Sheeting shall resist exposure without visible deterioration when tested not less than 400 hours in accordance with ASTM D 822. Sheeting shall not crack or flake when exposed to low temperatures.

2.18.10 Miscellaneous Sheet Metal Roofing Materials:

2.18.10.1 Wood Batten Strips shall be non-stress graded wood members of nominal 2 inches by 2 inches, pressure-treated with waterborne preservatives in compliance with AWPB LP-2, or other material that is compatible with sheet metal.

2.18.10.2 Polyethylene Underlayment shall be a minimum of 6 mil chlorinated polyethylene film.

3.0 EXECUTION: Installation of sheet metal materials shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual.

3.1 Nailing Strips and Edge Blocking: When deck surface is non-nailable, nailing strips and edge blocking shall be installed over surface of deck for anchorage of sheet metal materials.

3.2 Substrate Conditions: Surfaces to receive sheet metal materials shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect application.

3.3 Fasteners shall be concealed wherever possible in exposed work.

3.4 Dissimilar Surfaces:

3.4.1 Separate Dissimilar Metals by painting each metal surface in areas of contact with bituminous coating, or provide a layer of waterproof sheathing paper or asphalt-coated felt between contact surface.

3.4.2 Separate Metal Items from treated wood and cementitious materials with bituminous coating, applied either to substrate or metal.

3.4.3 Aluminum shall not be used when it will be in contact with copper or where it will contact water that flows over copper surfaces. Protect aluminum surface in contact with wet or pressure treated wood, cementitious materials, or ferrous metals from galvanic or corrosive action by applying one coat of zinc



chromate primer and one coat of aluminum paint, or by placing layer of nonabsorptive tape or gasket between adjoining surfaces.

3.4.4 Where Asphalt-Saturated Felt has been applied under sheet metal that will be soldered or welded, cover felt with one layer of sheathing paper before installing sheet metal.

3.5 Sheet Metal Roofing:

3.5.1 Removing Existing Sheet Metal Roofing: Remove sheet metal roofing in full sections or cut damaged sections where possible to make watertight joints between existing roofing and new materials to be installed.

3.5.2 Preparing Existing Surfaces: Bent or raised portions of existing roofing shall be nailed down and repaired to extent necessary to provide smooth surface for sheet metal roofing.

3.5.3 Application of Underlayment:

3.5.3.1 Felt Underlayment: Apply one layer of asphalt-saturated roofing felt over deck surface and cover with one layer of sheathing paper. Underlayment plies shall be installed with mechanical fasteners spaced 6 inches in center at laps or adhesives as appropriate for substrate conditions.

3.4.3.2 Polyethylene Film Underlayment: Install one layer of polyethylene film underlayment over deck surface with adhesive. Cover polyethylene film with one layer of sheathing paper applied with adhesive. Mechanical fasteners shall be installed only where deck surface presents nailable conditions.

3.5.4 Coating Backside of Metal Sheets:

3.5.4.1 Bituminous Coating: Coat back side of metal roofing with bituminous coating wherever metal will be in contact with wood, ferrous metal, or cementitious construction.

3.5.4.2 Painting: Paint back side of metal roofing with zinc chromate type primer, minimum 2-mil dry film thickness.

3.5.5 Expansion Seams: Provide loose lock or slip seams, as designated. Seams shall allow 1/2-inch for expansion and shall be sealed with sealant.

3.5.6 Penetrations Through Roofing shall be flashed with sheet metal material to match roofing material.



Section 07705 Roof Accessories

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heat and smoke vents, roof hatches, gravity ventilators, prefabricated curbs and equipment supports, and curb-set expansion joints. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Comply with SMACNA Architectural Sheet Metal Manual details for fabrication of units, including flanges and capflashing to coordinate with type of roofing indicated.

2.1 Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.

2.2 Stainless Steel: AISI Type 302/304, ASTM A 167, 2D annealed finish except as otherwise indicated, tempered as required for forming and performance.

2.3 Aluminum Sheet: ASTM B 209, Alloy 3003, tempered as required for forming and performance; AA-C22A41 clear anodized finish, except mill finish prepared for painting where designated for field painting.

2.4 Extruded Aluminum: Alloy 6063-T52; 0.078 inch minimum thicknesses for primary framing and curb member legs, 0.062 inch for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise designated.

2.5 Insulation: Rigid or semi-rigid board of glass fiber.

2.6 Wood Nailers: Softwood lumber, pressure-treated with water-borne preservatives for above ground use, complying with AWPB LP-2; not less than 1-1/2 inches thick.

2.7 Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal. Match finish of exposed fasteners with finish of material being fastened. Where removal of exterior exposed fasteners affords access to building, provide non-removable fastener heads.

2.8 Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

2.9 Bituminous Coating: Fed. Spec. TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.

2.10 Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.11 Elastomeric Sealant: Type that is compatible with joint surfaces; ASTM C 920 and ASTM C 1184.

2.12 Roofing Cement: ASTM D 2822, asphaltic.

2.13 Prefabricated Heat/Smoke Vents: Provide units that have been tested, listed, and labeled by UL (Class A) or FM, as designated. Except as otherwise designated, fabricate for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Fabricate framing of the following materials as designated, with manufacturer's standard welded or sealed mechanical corner joints, including cap flashing:

- a. Formed or extruded aluminum.
- b. Zinc-coated steel.



c. Formed or extruded aluminum or zinc-coated steel.

2.13.1 Hatch-Lid Type Units: Fabricate with single or double aluminum covers with 1 inch integral insulation and gaskets. Equip units with automatic self-lifting mechanisms and fusible links or other heat-sensitive or smoke-sensitive release devices as indicated, and with complete hardware including hold-open devices and independent manual release devices for inside and outside operation of covers.

2.13.2 Fusible-Dome Type Units: Provide manufacturer's standard shrinkback/drop-out polyvinyl chloride sheet dome unit for 210 F activation; with light transmittance of 40 percent, proven 10-year weather resistance, exterior acrylic protective coating, and maximum flame spread rating of 25 (UL 723). Equip each unit with external safety grid capable of supporting 200 pound loading. Provide glazing system for easy replacement of activated domes and for drainage of condensation to exterior.

2.14 Prefabricated Roof Hatches: Fabricate units as single-leaf type unless otherwise directed, for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Frame with 9-inch high integral-curb double-wall construction with 1-1/2 inch insulation, cant strips, and cap flashing, with welded or sealed mechanical corner joints. Provide double-wall cover construction with 1 inch insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of following materials as designated:

- a. Aluminum sheets and extrusions.
- b. Zinc-coated steel sheets.
- c. Zinc-coated steel sheet curbs and aluminum covers.
- d. Aluminum or zinc-coated steel, or in combination.

2.15 Louvered Penthouse Gravity Ventilators: Provide units fabricated with weatherproof aluminum extrusion louvered walls with mitered or boxed corner construction; with aluminum sheet cover and 1 inch insulation adhesively applied on underside; and with extruded aluminum base and cap flashing for mounting on curbs which are not integral with units. Equip units with manual dampers designed for operation from floor directly below ventilator unit. Equip unit with bird or insect screens as directed, located internally to discourage nesting.

2.16 Prefabricated Vertical-Type Gravity Ventilators: Provide units fabricated from the following materials and including the following features, as designated:

- a. Zinc-coated steel sheet, prime painted.
- b. Aluminum sheet, prime painted.
- c. Aluminum sheet, mill finish.
- d. Equip with bird screens.
- e. Equip units with dampers, with manual operation device extended to 6 ft 6 in above floor.

2.17 Prefabricated Curbs/Equipment Supports: Comply with loading and strength requirements designated where units support other work. Coordinate dimensions with rough-in sheets or shop drawings of equipment to be supported. Fabricate of structural quality sheet steel (ASTM A 570) that has been prepared for painting, factory-primed, and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication. Fabricate with welded or sealed mechanical corner joints and with cant strips and base profile coordinated with roof insulation thickness. Except as otherwise designated or required for strength, fabricate units of minimum 14-gauge metal and to minimum height of 12 inches.

2.18 Curb-Set Expansion Joints: Provide extruded aluminum expansion joint units designed for installation on raised curbs. Equip with curb cap, cap flashing, and waterproof bellows of 30- or 60-mil elastic flashing sheet of neoprene, EPDM, butyl rubber, or chlorinated polyethylene. Provide mineral-fiber insulation, concealed under curb cap between curbs, to form a waterproof, airtight, insulated, expansion joint system. Provide units in styles required for roof-to-roof, roof-to-wall, and wall-to-wall applications as required;

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complete with prefabricated corner and intersection units as required; equipped with special field-splice provisions to ensure permanent continuous waterproof installation of expansion joint system.

3.0 EXECUTION: Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Except as otherwise designated, install roof accessory items in accordance with construction details of NRCA Roofing and Waterproofing Manual.

3.1 Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces or provide other permanent separation.

3.2 Flange Seals: Except as otherwise directed, set flanges of accessory units in a thick bed of roofing cement to form a seal.

3.3 Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant, except where overlap is required to be left open for ventilation.



Section 07811 Plastic Skylights

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of plastic skylights. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Single Thickness Plastic Skylights shall be formed to a standard dome profile.

2.2 Double Thickness Plastic Skylights shall have an average 1-inch minimum air space between sheets formed to a standard dome profile, with a standard hermetic edge seal.

2.3 Color: Exterior sheets shall be colorless transparent sheet or bronze tinted transparent sheet, 25-30 percent light transmittance in accordance with ASTM D 1003. Interior sheets shall be colorless transparent sheet.

2.4 Glazing Frame, Dome Retainers, and Trim shall be extruded aluminum.

2.5 Curb Frame shall be extruded aluminum including cap flashing to receive roofing counterflashing.

2.5.1 Curb-Mounted Units shall be designed for installation on nominal 1-1/2 inch thick wood curbs.

2.5.2 Insulated Curb Units shall be self-flashing units with integral, self-supporting double wall formed or extruded or combination aluminum curb, 0.040-inch minimum sheet thickness enclosing minimum 1-inch glass fiberboard or equivalent insulation and with minimum 3-inch roof flanges; welded or sealed mechanical joints at corners.

2.5.3 Curb Height shall be 9 inches minimum above line of roofing or custom height as required. For decks that slope 1/4 inch per ft., tapered curb heights shall match slope to provide a level installation of domes.

2.6 Glazing Systems of neoprene, closed cell sponge neoprene, PVC gasketing, partially vulcanized butyl tape, or liquid-applied elastomeric sealant shall be provided.

2.7 Condensation Control on inside of domes shall be provided using fabricated units with integral internal gutters and nonclogging weeps.

2.8 Plastic for Skylights shall be cast acrylic with abrasion-resistant coating on exterior surface, for 2 percent maximum haze increase of 100 revolutions on 500 g Taber abraser in accordance with ASTM D 1044; 14,500 psi flexural strength; 180 F continuous service temperature or cast polycarbonate with 13,500 psi flexural strength; 240 F continuous service temperature; 16 ft-lb IZOD impact strength. Skylights shall meet AAMA 1601.1 recommendations for thickness of plastic domes to maintain 40 psf loading (for support of ice and snow only).

2.9 Bituminous Coating shall be in accordance with Fed. Spec. TT-C-494 solvent type bituminous mastic, nominally free of sulphur, compounded for 15-mil dry film thickness per coating.

2.10 Roofing Cement shall be asphaltic complying with ASTM D 2822.

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2.11 Mastic Sealant shall be polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

3.0 EXECUTION:

3.1 Installation of Skylights shall be coordinated with installation of roof deck or other substrates and with vapor barriers, roof insulation, roofing, and flashing as required to ensure that combined elements are waterproof and weathertight. Units shall be anchored securely to supporting structural substrates to withstand lateral and thermal stresses including inward and outward loading pressures.

3.2 Isolation: Where metal surfaces of units are required to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

3.3 Flange Seals: Where required, set flanges of accessory units in a thick bed of roofing cement to form a seal.

3.4 Cap Flashing: Where cap flashing is required, install to provide adequate waterproofing overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.5 Cleaning: Clean exposed metal and plastic surfaces.



SECTION 07812 METAL-FRAMED SKYLIGHTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal-framed skylights. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal-Framed Skylight Panels shall be 2-1/4 inch thick double-faced panels consisting of glass fiber reinforced polymer, with interior and exterior faces bonded under controlled heat and pressure to a mechanically interlocked aluminum grid core. Exterior face shall have a special erosion protective surfacing.

2.1.1 Panel Performance Characteristics:

2.1.1.1 Color Stability from Weathering: Exterior face shall not change more than 3.5 adams units (Delta E by ASTM D 2244) as determined by an average of three samples after a minimum of outdoor exposure of 60 months in south Florida at 7 degrees facing south.

2.1.1.2 Interior Fire Resistance Characteristics shall be in accordance with ASTM E 84, with flame spread of 45 maximum and a smoke developed rating of 350 maximum. Burn extent shall be 1 inch or less by ASTM D 635.

2.1.1.3 Exterior Face Impact Resistance shall be 60 ft-lb minimum.

2.1.1.4 Coefficient of Linear Expansion shall be 1.24×10^{-5} in./in./F.

2.1.2 Laminate Adhesive shall be heat and pressure resin type. Minimum strength shall be 750 psi tensile strength by ASTM C 297 after two exposures to six cycles each of aging conditions prescribed by ASTM D 1037 and 500 psi shear strength average by ASTM D 1002 after five prescribed exposures.

2.1.3 Grid Core shall be 6063-T6 aluminum I-beams with 7/16-inch flange width, mechanically interlocked to ensure even muntin to muntin intersection.

2.1.4 Aluminum Frame shall be 6063-T5 aluminum with mill finish or corrosion-resistant finish as required with mitered and heli-arc welded corners. Clamp fasteners shall be stainless steel.

2.1.5 Panel U-Values determined by ASTM C 236 shall be as designated.

2.2 Pre-Engineered Self-Supporting Roof Systems shall be one of the following standard types as required:

2.2.1 Continuous Vaulted type shall be semi-circular.

2.2.2 Pyramid type shall be self-supporting.

2.2.3 Grid type shall be 4-foot minimum width by 16-foot maximum length as required.

2.2.4 Preformed Acrylic

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2.2.5 Structural Roof Design Loads shall be based on location of installation. Joint and structural systems shall be manufacturer's standard types or special designed systems as required. Roof systems shall be fastened to supports as recommended by the roof system manufacturer.

2.2.6 Flashings shall be aluminum, 0.040 inch thick minimum.

2.3 Optional Face Sheet Material for metal-framed skylight panels shall be 1/8-inch thick clear acrylic panels assembled in accordance with manufacturer's recommendations. Panel assemblies shall be limited to 4-foot by 4-foot modules composed of 12 inches by 24 inches or 8 inches by 20 inches nominal grid size as required.

2.4 Panels may be 1-9/16 inch thickness where required.

3.0 EXECUTION: (Section not used.)



Section 07920 Sealants

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sealants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Oil-Based Calking Compound shall conform to ASTM C 570, Type I.

2.2 Two-Component Polyurethane Sealant shall be an elastomeric type compound conforming to ASTM C 920, Type M, Grade NS, resistance to joint movement as measured at time of application as required. The compound shall be supplied in pre-measured kit form for on-the-job mixing.

2.3 Butyl Rubber Sealant shall conform to ASTM C 1085, as required.

2.4 Single-Component Polysulfide Sealant shall be an elastomeric type compound conforming to ASTM C 920, Type S, Grade NS, resistance to joint movement as measured at time of application as required.

2.5 Polyisobutylene-Based or Isoprene-Isobutylene-Based Pressure-Sensitive Tape or Bead: When applied between two clean, dry surfaces of specified thicknesses and under conditions of continuous pressure that will be encountered in use, the sealant shall seal the joint from water and shall be weather-resistant. The material shall be nonbleeding at 160 F and below, shall withstand temperature ranges from minus 30 F to 200 F without loss of adhesion and without slipping, and shall have properties allowing the compound to move with the expansion and contraction of structure. The tape or bead shall be plain or contain a cloth or fiber insert. The tape or bead shall be supplied in rolls with a removable paper for cloth backing.

2.6 Silicone Rubber Base Sealant shall be an elastomeric type compound conforming to ASTM C 1184, resistance to joint movement as measured at time of application as required.

2.7 Preformed Strip Sealants:

2.7.1 Preformed Butylene Strip Sealant shall be foamed-urethane strip saturated with a butylene waterproofing material.

2.7.2 Preformed Asphalt Impregnated Strip shall be asphalt-impregnated foamed-polyurethane strip.

2.8 Acoustical Sealant: Synthetic rubber or polymeric-based material shall conform to the following:

2.8.1 Consistency: ASTM D 217, 190 to 310.

2.8.2 Aging: Slightly tacky at 160 F after 50 days.

2.8.3 Accelerated Aging: No significant change after 260 hours in weathermeter.

2.8.4 Nonstaining.

2.8.5 Solids Content: Approximately 80 to 90 percent.

2.8.6 No Oil Migration.

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2.9 Silicone RTV Foam Firestop Sealant shall be a medium-density two-part product supplied as liquid components. When components are thoroughly mixed in a one-to-one ratio by either weight or volume the sealant shall expand and cure to a foamed elastomer at room temperature in 1 to 3 minutes. Sealants for fire-rated penetration seal designs shall bear UL classification for 1, 2, or 3-hour fire-rating, as required to match rating of the penetrated construction.

2.10 Sealer: Sealer for use with oil-based calking compound shall be aluminum paint.

2.11 Primer: Primer for two-component polyurethane sealant, butyl rubber sealant, and single-component polysulfide sealant shall be as recommended by the sealant manufacturer. Primer shall have been tested for durability with the sealant to be used and on samples of the surfaces to be sealed.

2.12 Backstop Material: Backstop material shall be resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, preformed neoprene, neoprene rod, oilless dry jute, or rope yard. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity. Preformed support strips for ceramic and quarry tile control joint and expansion joint work shall be polyisobutylene or polychloroprene rubber.

2.13 Bond-Preventive Materials shall be pressure-sensitive adhesive polyethylene tape, aluminum foil, or wax paper. Backstop material with bond-breaking characteristics may be installed in lieu of bond-preventive materials specified.

3.0 EXECUTION:

3.1 General Surface Preparation: The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from all joint surfaces to be sealed. Oil and grease shall be removed with solvent and surfaces shall be wiped with clean cloths.

3.2 Concrete and Masonry Surfaces: Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.

3.3 Steel Surfaces: Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.4 Aluminum Surfaces: Aluminum surfaces of windows and door frames in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coatings shall be as recommended by the manufacturer of the aluminum work and shall be nonstaining.



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SECTION 08110 HOLLOW METAL DOORS AND FRAMES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hollow metal doors and frames. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: All hollow metal doors and frames shall comply with the following Specifications. The publications are referred to in the text by basic designation only

STEEL DOOR INSTITUTE (SDOI):

SDOI SDI-100	Standard Steel Doors and Frames.
SDOI SDI-106	Standard Door Type Nomenclature
SDOI SDI-107	Hardware on Steel Doors (Reinforcement – Application)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 236	Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
ASTM C 976	Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box
ASTM D 2863	Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E 90	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
ASTM E 283	Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

DOOR AND HARDWARE INSTITUTE (DHI)

DHI A115.1G	Installation Guide for Doors and Hardware
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NATNL. ASSOC. OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA 862	Hollow Metal Manual; Section: Guide Specifications for Commercial Security Hollow Metal Doors and Frames
NAAMM HMMA 865	Hollow Metal Manual; Section: Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	Fire Doors and Windows
NFPA 80A	Protection of Buildings from Exterior Fire Exposures
NFPA 101	Safety to Life from Fire in Buildings and Structures
NFPA 252	Fire Tests of Door Assemblies

2.2 Hollow Metal Doors: Doors shall be SDI-100 standard types, styles, and sizes as designated. Doors shall be reinforced to receive builder's hardware in compliance with the requirements of ANSI A115. Provide glazing beads and stops for glass panels and sight-proof louvers as required. Louvers shall be non-



removable from the outside of exterior doors or the un-secure side of interior doors. Louvers shall be furnished with removable insect screens. Doors shall be galvanized. Doors to be field-finished shall receive a shop prime coat. A baked-on finish coat shall be provided for factory-finished doors. Exterior doors shall have top edges closed flush and sealed against water penetration.

2.3 Hollow Metal Frames: Hollow metal frames for doors, transoms, side lights, borrowed lights, and other openings shall be SDI-100 standard types, styles, and sizes as designated. Frames shall be provided with mitered corners and welded construction for exterior applications and knocked-down for field assembly for interior applications. Frames shall be reinforced to receive builder's hardware in compliance with the requirements of ANSI A115. Provide three wall anchors per jamb at hinge and strike levels. For wall conditions that do not allow the use of a floor anchor, an additional jamb anchor shall be provided. Rubber silencers shall be furnished for installation into factory predrilled holes in door frame. Adhesive applied silencers are not acceptable. Provide plaster guards or mortar boxes at hinges and strikes or elsewhere required. Finish shall be as specified for doors.

2.4 Fire-Rated Assemblies: Fire doors and frames shall be identified with recognized testing laboratory labels indicating the applicable fire rating. The constructed and installed assemblies shall comply with the requirements of NFPA 80, NFPA 80A and NFPA 252.

2.5 Soundproofing Metal Doors: Soundproofing metal doors shall be identified with recognized testing laboratory labels indicating the applicable STC soundproofing rating. Soundproofing rating shall be STC 45 or as required.

2.6 Hollow Metal Comb. Storm and Screen Doors: See Section 08390.

2.7 Access Doors and Panels Access doors in fire-rated walls and ceilings will be of equivalent fire ratings. Doors and panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 16 gauge steel with welded joints and finished with anchorage for securing into construction. Access doors shall be a minimum of 14 by 20 inches and of not lighter than 14 gauge steel, with stiffened edges, complete with attachments. Access doors shall be hinged to frame and provided with a flush face, screw driver operated latch. Exposed metal surfaces shall have a baked enamel finish or shop applied prime coat.

3.0 EXECUTION:

3.1 Frame Installation: Installation of frames shall comply with the provisions of SDI-105, Recommended Erection Instructions for Steel Frames. Fire-rated frames shall be installed in compliance with NFPA 80.

3.1.1 Frames shall be set plumb and true and fully insulated. The floor under the sill, if poured, shall be level and smooth.

3.2 Door Installation: Hollow metal doors shall be fit accurately in frames within clearances specified in SDI-100. Fire-rated doors shall be installed within clearances specified in NFPA 80.

3.3 Delivery and Storage: Doors and frames shall be stored in an upright position in accordance with DHI A115.1G.

3.4 Soundproofing Metal Door and Frame: Sound rated doors and frames shall be factory fabricated in accordance with NAAMM HMMA 865.



SECTION 08115 ALUMINUM DOORS AND FRAMES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hinged aluminum doors and frames. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Extrusions shall comply with ASTM B 221M, ASTM B 221, Alloy 6063-T5 or -T6, except alloy used for anodized color coatings shall be required to produce the specified color. Aluminum sheets and strips shall comply with ASTM B 209M; ASTM B 209, alloy and temper best suited for the purpose.

2.2 Glazed Aluminum Stile-And-Rail Doors and Frames shall be manufacturer's standard type. Adjacent glass enclosures, transoms, and/or sidelights shall be of the same style and design as the doors and frames.

2.2.1 Screws, Nuts, Washers, Rivets, and other miscellaneous fastening devices shall be of hardened aluminum, stainless steel, or other corrosion-resistant material.

2.2.2 Nominal Wall Thickness for Doors shall be not less than 0.125 inch except that the molding shall be not less than 0.062 inch.

2.2.3 Frames shall be extruded tube or open channel shapes not less than 0.125 inch thick for frames 1-3/4 inches by 4 inches and not less than 0.090 inch thick for frames 1-3/4 inches by 4-1/2 inches. Glazing beads, moldings, and trim shall be not less than 0.050 inch thick. Doors shall have extruded aluminum snap-in glass stops with vinyl insert.

2.3 Flush Aluminum Doors:

2.3.1 Doors shall be constructed of tubular frame members, fabricated with reinforced mechanical or welded joints. Limit frame exposure to 3/4 inch maximum width on door faces.

2.3.2 Core shall be resin-impregnated Kraft paper with honeycomb, rigid closed-cell polyurethane insulation, or rigid noncombustible mineral insulation board.

2.3.3 Faces shall be of aluminum sheet of 0.062-inch minimum thickness, mechanically interlocked with frame members or laminated to core and framing with waterproof glue to form door thickness of 1-3/4 inches.

2.3.4 Lights (glazed openings in doors) shall have aluminum moldings and stops, with inside removable stops.

2.3.5 Frames shall be of tubular and channel frame assemblies, with either welded or mechanical joints, reinforced as necessary to support required loads and door hardware.

2.4 Aluminum Combination Storm and Screen Doors: See Section 08390.



2.5 Weather-stripping: Weather-stripping shall be door manufacturer's standard applied to stiles, heads, and bottoms of exterior doors and shall be easily replaced without special tools.

2.6 Finishes: Aluminum surfaces shall be provided with one of the following finishes. The coating shall have a minimum film thickness of 0.0004 inch with a minimum weight of 17 milligrams per square inch when tested in accordance with ASTM B 137. Coating shall be sealed with hot water.

2.6.1 Anodic Coating (0.4 mil to 0.7 mil): Aluminum Association (AA) AA-M12-C22-A31, Architectural Class II, Clear-Anodized or AA-M12-C22-A32, AA-M12-C22-A34, Architectural Class II, Color-Anodized.

2.6.2 Organic Coating (minimum 0.8 mil): AAMA 603.8, Baked-Enamel finish.

2.7 Special Finishes:

2.7.1 Anodic Coating (minimum 0.7 mil): AA-M12-C22-A41, AA-M12-C22-A42, or AA-M12-C22-A44, Architectural Class I, Color-Anodized.

2.7.2 Organic Coating (minimum 1.2 mil): AAMA 605.2, High Performance finish not less than 70 percent polyvinylidene fluoride resin by weight.

3.0 EXECUTION: Aluminum surfaces in contact with dissimilar materials shall be back-painted with alkali-resistant paint before erection. Comply with manufacturers written installation instructions. Install frames plumb and square, securely anchored to adjoining surface with fasteners recommended by manufacturer. Clean exposed surfaces promptly after installation.



SECTION 08220 WOOD DOORS AND FRAMES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood doors and frames. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Top and bottom edges of doors shall be sealed prior to shipment. Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door. The identifying mark, or a separate certification, shall include identification of the standard on which construction of the door is based, identity of the manufacturing plant, identification of the standard under which preservative treatment, if used, was made, and identification of the doors having a Type I glue bond.

2.2 Flush Doors: Solid core and hollow core flush doors shall conform to National Wood Window & Door Association - NWWDA I.S.1. For stain or natural finish, doors shall be of Good Grade veneer in accordance with NWWDA I.S.1. For paint finish, doors shall be Standard Grade in accordance with NWWDA I.S.5 or Sound Grade or hardboard-faced in accordance with NWWDA I.S.1. Unless otherwise required for fire safety, solid core doors shall have wood block core or mat-formed particleboard core conforming to NWWDA I.S.1. Hollow core and mat-formed particleboard solid core doors shall have lock blocks. Openings in exterior doors shall be weatherproof.

2.3 Paneled Doors shall conform to NWWDA I.S.5 or FHDA/7. For stain or natural finish, doors shall be Premium Grade in accordance with NWWDA I.S.5 or Selected Grade in accordance with FHDA/7. For paint finish, doors shall be Standard Grade in accordance with NWWDA I.S.5. When laminated panels are furnished, they shall not be less than three plies. Flat panels shall have a minimum finished panel thickness of 5/8 inch. Raised panels shall have a minimum finished panel thickness of 3/4 inch.

2.4 Fire Doors: Fire rated door assemblies shall bear the listing identification label of a nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with NFPA 252 and having a listing for the tested assemblies. Door assemblies shall be in accordance with NFPA 80. Listing identification on labels shall be constructed and permanently applied by a method, which results in their destruction, should they be removed.

2.5 Storm Doors – See Section 08390

2.6 Screen Doors – See Section 08390

2.7 Preservative Treatment: Exterior softwood doors shall be water-repellent preservative treated and so marked at the plant in accordance with NWWDA I.S.4.

2.8 Adhesives: Adhesives shall be in accordance with NWWDA I.S.1, using requirements for Type I doors for exterior doors and requirements for Type II doors for interior doors. Adhesive for doors to receive a natural finish shall be non-staining.

2.9 Accessories: All doors shall have cutouts, stops, beads, or other accessories as required to receive builder's hardware, glazing, louvers, or other design specialties and penetrations.



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2.10 Wood Frames: Wood frames shall be custom grade in species to match door face veneer species. For exterior door openings, frames shall be rabbeted from a solid board to provide an integral stop. For interior frames, applied stops are permitted unless otherwise indicated. Jamb sections shall be dadoed and screwed in place. Finish for frames and trim shall match the doors. Wood frames shall comply with Architectural Wood Institute's AWI-02 Section 900.

3.0 EXECUTION:

3.1 Fire Door Installation: Installation and operation characteristics of fire doors shall conform to NFPA 80, 80A, and 101.

3.2 Door and Frame Storage: Doors shall be stored in fully covered areas and protected from damage and from extremes in temperature and humidity. Doors shall be stored on supports to prevent warping or twisting, and to provide ventilation. Factory cartons or wrappers shall be kept intact until installation.

3.3 Door Installation: Doors shall be fit, hung, and trimmed as required. Door shall have a clearance of 1/8 inch at the sides and top and shall have a bottom clearance of 1/4 inch over thresholds and 1/2 inch at other locations unless otherwise directed. Cuts made on the job shall be sealed, immediately after cutting, using a clear varnish or sealer. Bottom of doors shall be undercut to allow clear door swing over carpeted areas. Vertical edges of doors, which have not been rounded or beveled at the factory, shall be eased when the doors are installed.

3.4 Wood Frame Installation: Frames shall be set plumb and square, and rigidly anchored in place securely seated to floor using finish type nails. Double wedge blocking shall be provided near the top, bottom, and mid-point of each jamb.

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SECTION 08312 ALUMINUM AND WOOD SLIDING GLASS DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding glass doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aluminum Sliding Glass Doors shall be complete units with safety glass, weatherstripping, hardware, and integral tracks and rollers for smooth operation and installation. Sliding glass door panels shall conform to AAMA 101. Classification of sliding glass doors shall be AAMA type SGD-A3 (monumental grade) provided for high performance (HP) designation.

2.2 Wood Sliding Glass Doors shall consist of wood frame sliding and fixed safety glass panels and casings of selected West Coast hardwood treated with water repellent and factory-primed for exposed wood exterior frame parts and door panels. Sill facing shall be extruded anodized aluminum with PVC thermal barrier. Operating door track shall have stainless steel cap. Each unit shall include door panels, head and sill, track rollers (ball-bearing sheaves), weatherstripping, glazing channels, hardware, and accessories.

2.3 Hardware shall include door pulls and keyless locking with interior locking lever on operating door panel.

2.4 Glazing in door panels shall be safety glass in compliance with ANSI Z97.1.

2.5 Screen Doors shall be manufacturer's standard furnished with sliding doors. Insect screen shall be 18 x 16 mesh aluminum wire conforming to Fed. Spec. RR-W-365 or plastic-coated fibrous glass standard with the manufacturer.

3.0 EXECUTION: Installation of door units shall be complete with all necessary anchors, inserts, and hardware.



SECTION 08316 SLIDING FIRE DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding fire doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.1 Composite Sliding Fire Doors shall be standard steel face sheets bonded to and supported by rigid, dimensionally stable inorganic core, with steel reinforced edges. Finish shall be factory-primed.

2.2 Hollow Metal (Sheet Metal) Sliding Fire Doors shall be standard flush design with not less than 20-gauge steel faces over steel stiffeners or honeycomb core materials. Finish shall be factory-primed.

2.3 Tin-Clad Sliding Fire Doors shall be standard design wooden core construction with 14-inch by 20-inch maximum size, 30-gauge galvanized steel sheets not over 48 inches wide with venting as required by NFPA 80. Finish shall be galvanized.

2.4 Horizontal Sliding Steel Doors shall be standard design consisting of two thicknesses of 24-gauge galvanized corrugated sheet steel with an asbestos core and framed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Finish shall be galvanized.

2.5 Vertical Lift Sliding Steel Doors shall be standard design consisting of two thickness of 24-gauge galvanized corrugated sheet steel with an asbestos core and framed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Door shall be uprising on vertical tracks. Finish shall be galvanized.

2.6 Metal-Clad (Kalamein) Doors shall be standard horizontal sliding metal covered wood core or stiles and rails and insulated flush panels covered with steel. Finish shall be factory-primed.

2.7 Fire Door Assemblies shall be provided as complete units produced by one manufacturer.

2.7.1 Fire Doors, Frames, and Fire Door Hardware shall be types that comply with NFPA 80 and have been fire-tested and rated in accordance with ASTM E 152. Doors shall bear labels of the Underwriters' Laboratories, Incorporated or Factory Mutual Laboratories as evidence of rating.

2.7.2 Components for rated door assembly shall be listed in UL Building Materials Directory or Factory Mutual Approval Guide.

2.8 Finish: Galvanized finish shall be hot-dip galvanized minimum 0.6 ounce per square foot and shall not be factory-primed.

2.9 Fire Door Hardware: Hardware shall be labeled, automatic closing type sliding fire door assemblies complete with adjustable roller guides, binders, floor stops, cables, sheaves, counterweight, and fusible links. Fusible links shall be UL listed, 165 F for ordinary temperature classification.

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2.10 Accessories: The following items shall conform to the requirements of NFPA 80: Astragal, chafing strips, bumper shoes, rear binder, stay rolls, wedge, and automatic closer.

2.11 Power Operators: The operator shall be electrically operated and shall conform to NFPA 80 requirements. The powered actuating device shall be provided with a UL or FM listed releasing mechanism that will permit the required self-closing feature to function and automatically close the door in the event of fire irregardless of power failure or manual operation. Leading edge of door shall include a reversing safety device, reversing when obstruction encountered. Easily adjustable limit switches shall be provided to automatically stop the door in its full open or closed position. All door operating devices shall be suitable for the Class, Division, and Group shown and as defined in NFPA 70.

3.0 EXECUTION:

3.1 Installation: Fire doors shall be installed in accordance with NFPA 80 and manufacturers recommendations. Doors shall be securely anchored in place to a straight, plumb, and level condition without distortion.

3.2 Temporary Fire Protection: During the execution of this work, temporary fire barriers, alarms, or watchmen shall be provided to the degree of opening protection required by the local authority until the permanent work is completed and operational.



SECTION 08317 SECURITY VAULT DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of security vault doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 VAULT DOOR AND FRAME: Design and construction of the door and frame assembly shall conform to FS AA-D-00600. The door shall be Class 5, with either right or left opening swing, Style K - key change combination lock. Vault doors shall meet the requirements for GSA labeling unless custom sizes are required.

3.0 EXECUTION

3.1 INSTALLATION: The vault door assembly shall be installed in strict compliance with the printed instructions and drawings provided by the manufacturer. After installation, the door, the locking mechanism, and the inner escape device shall be adjusted for proper operation.

3.2 DELIVERY AND STORAGE: Vault Door and frame assemblies shall be delivered to the site in a protective covering, clearly marked with manufacturers name and model. Storage shall be in a ventilated, dust free, dry, humidity controlled location allowing for inspection and meeting all manufacturers written requirements. Vault doors and frames shall be elevated off the floor and rest on non-absorptive strips or wood platforms. Damage to either door or frame that cannot be restored to like-new condition shall be replaced.

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SECTION 08330 COILING (ROLLING) DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coiling doors, coiling grilles, and coiling counter shutters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Doors shall be the manufacturer's standard type. Doors shall be spring counterbalanced, overhead coiling type; coiling grilles shall be overhead or side coiling type. Door shall be complete with all guides, tracks, hardware, fastenings, operating mechanisms, and accessories. Guides at jambs shall be set back a sufficient distance to provide a clear opening when doors are in the open position.

2.1 Roller Shaft: The roller shaft shall be constructed of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of the curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of roller shall be closed with cast-iron plugs, machined to fit the pipe. An oil-tempered, helical, counter-balancing steel spring, capable of producing sufficient torque to ensure easy operation of the door curtain from any position, shall be installed within the roller. Spring shall be easily adjustable.

2.2 Brackets: Brackets shall be fabricated of heavy cast iron or steel, designed to close the ends of roller-shaft housing and to form a supporting ring for hood. The bracket hubs or shaft plugs shall be equipped with prelubricated ball bearings, shielded or sealed.

2.3 Hoods: Each hood shall be constructed of steel not lighter than No. 24-gauge, formed to fit the contour of end bracket gear assembly and reinforced with steel rods or rolled beads at top and bottom edges. A weather baffle shall be provided at the lintel.

2.4 Gears: Gears shall be of the best grade gray iron, cast iron teeth machine-molded from machine-cut patterns, enclosed and protected by the hood and brackets.

2.5 Guides: The guides shall consist of steel shapes not less than 2-1/2 inches deep and not less than 3/16-inch thick and shall form a channel pocket of sufficient depth to retain the curtain in place under the wind pressure specified. Provisions for removal of the door shall be included in the design.

2.6 Head Track: Head track for side coiling grilles shall be of extruded aluminum and shall be provided with adjustable hangers spaced not more than 2 feet-6 inches on center.

2.7 Floor Track: Floor track for side coiling grilles shall be of extruded aluminum with replaceable bronze strips, flush with finish floor and shall provide a floor slot with a maximum width of 1/4 inch.

2.8 Bottom Rail: The curtain shall have a rolled-steel bottom bar consisting of two angles of equal weight, one on each side, fastened to the bottom of the curtain.

2.9 Endlocks and Windlocks: The ends of each slat shall have malleable iron endlocks of the manufacturer's standard design. The door shall have windlocks at the ends of each slat. Windlocks shall prevent curtain from leaving the guide as a result of deflection from wind pressure or other forces.

2.10 Weatherstripping: Doors exposed to weather shall have manufacturer's standard weatherstripping on jambs, top, and sill for weathertight installation.



2.11 Curtains:

2.11.1 Curtains for Coiling Service Doors shall be formed of insulated interlocking galvanized steel slats of No. 20- gauge minimum thickness or of flat steel interlocking slats. The curtains shall be designed to resist designated wind pressure without damage. The curtains shall roll up on a drum supported at the head of the opening on brackets and be balanced by helical springs.

2.11.2 Curtains for Coiling Grilles shall consist of 5/16-inch diameter mill finish aluminum, galvanized steel, or stainless steel rods spaced 2 inches on center to form brick pattern grille, with interlocking links to form a network of vertical and horizontal lines. Links shall be 9 inches apart.

2.12 Counter Doors (Roll-Up Shutters): Integral counter shutter/frame shall be manufacturer's standard. Curtains shall be aluminum, minimum 22-gauge galvanized steel, or stainless steel, minimum 22-gauge Type 302 No. 4 finish as designated. Frame shall be fully welded into a single assembly, complete with anchors; the jambs and head shall be minimum 16-gauge stainless steel or plain steel, and the sill shall be formed of 14-gauge stainless steel No. 4 finish.

2.13 Fire Doors: Doors, frames, hardware, and other accessories shall be in accordance with NFPA 80.

2.14 Operation:

2.14.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counter balanced to provide ease of operation while raising or lowering the curtain by hand. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.

2.14.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.

2.14.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on crank to not over 35 pounds.

2.14.4 Motorized Operation: Electric power-operated doors shall be complete with electric motors, operators, controls, switches, and safety devices. Control equipment shall comply with NEMA ICS 2.

2.15 Finish:

2.15.1 Galvanizing: Curtain and bottom rail shall be hot-dipped galvanized with a zinc coating not less than 1.25 ounces total per square foot of flat metal, coating class 1.25 in accordance with ASTM A 525. Hood shall have either class 1.25 galvanizing as described above or be fabricated from electrolytic zinc-coated sheets conforming to ASTM A 591. Hardware items shall be galvanized according to ASTM A 153. Items galvanized after assembly shall comply with ASTM A 123.

2.15.2 Pretreatment: All zinc-coated surfaces shall be given a phosphate coating prior to application of prime paint.

2.15.3 Shop-Applied Prime Paint: All ferrous surfaces, including galvanized curtain, hood, and slats, but excluding wearing surfaces, shall be given one shop-applied prime coat of the manufacturer's standard primer in accordance with Fed. Spec. TT-P-86. Primer shall be compatible with the specified finish paint and shall not contain lead. Non-galvanized surfaces shall be wire brushed to bare metal prior to primer application.

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3.0 EXECUTION: Guides shall be securely attached to adjoining construction. Doors shall be installed with all anchors and inserts for brackets, tracks, hardware, and other accessories located accurately. Upon completion, door shall be weathertight and shall be lubricated and adjusted to operate freely.



SECTION 08356 FLEXIBLE DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flexible doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory used for at least 2 prior years. Each new door unit shall be a complete unit produced by one manufacturer including hardware, accessories, mounting, and installation components.

2.2 Door Panels: Door panels shall be constructed of the following materials or equal.

2.2.1 Heavy-Duty, Abrasive-Resistant Rubber box beam extrusions, 70 durometer, 1,500 psi tensile strength. Panel thickness shall be 1-3/4 inch. Lower door panel shall be reinforced with additional rubber extrusions bonded horizontally to the door facing on 8 in centers.

2.2.2 Door Facings shall be high strength fabric reinforced vinyl bonded to door frame. Facing shall not be mechanically fastened.

2.2.3 The Vision Panels shall be be double glazed, damage resistant with optical clarity exceeding 90%. Vision Panels shall be mounted flush.

2.3 Door Panels shall be single- or double-acting, as required.

2.4 Panel Frame: Framing materials to which door panels shall be secured shall be galvanized steel, ASTM A 525, 11 gauge. Door panels shall be suspended between L-shaped rolled formed rails and stiles by removable bolt and nut connectors.

2.5 Hardware shall conform to the requirements of ASTM B 633, ASTM B 766, or ASTM A 123, as required.

2.5.1 Hinges shall be adjustable spring-type gravity self-lubricating hinges.

2.5.2 Header and Jamb Seals shall be door mounted PVC seals at head and jamb.

2.5.3 Jamb Guards shall be formed steel guards to enclose and protect lower hinge hardware and closures.

2.6 Door Jamb shall be constructed of steel tube, ASTM A 500, with integral wall anchors, galvanized in compliance with ASTM A 386 or stainless steel bent plate, Type 304, with integral wall anchors, as required.

2.7 Finish: All ferrous metal parts shall be finish-coated with polyurethane paint.

2.8 Fire Hazard Classification: All door panel materials shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications:

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Flame spread not more than 25.
Smoke developed not more than 50.

2.9 Vertical PVC Vinyl Strip Doors

2.9.1 Door shall consist of overlapping transparent minimum 1/8 inch thick PVC strips with pre-punched galvanized hanger brackets which mate with formed metal arms on the universal hardware.

2.9.2 Hardware shall provide full swivel action. A cover plate shall prevent accidental removal.

2.9.3 End Strips shall be orange to frame opening. Strips shall have rounded edges and overlap to form a seal.

3.0 EXECUTION: Products shall be installed per manufacturers written instruction. Products shall be firmly attached to adjacent materials. Products shall be installed level and plumb and shall be demonstrated to operate properly and as intended for a complete installation.



SECTION 08360 OVERHEAD DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of overhead doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Doors shall conform to the requirements of NAGDM 102 and shall be metal or wood overhead or vertical lift sectional type flush panel doors as indicated or required and shall be the products of a recognized manufacturer of the doors and accessories specified.

2.2 Door Assemblies shall be furnished with operating mechanisms, tracks, hardware, and all other necessary accessories required for complete installation and perfect operation.

2.3 Exterior Doors shall be metal sandwich construction filled with foamed-in-place insulation of sufficient density to attain the designated U-value or R-value. Doors shall have flexible neoprene weatherstripping at jambs, top, and sill.

2.4 Door Locks where required shall be five-pin cylinder locks and locking devices and shall be keyed as directed. Chain operators shall have standard devices for securing chain.

2.5 Fire Rated Doors: Where designated, doors, frames, hardware, and accessories shall bear the identifying label of the Underwriters' Laboratories, Inc., or a nationally recognized testing agency qualified to perform certificate programs indicating that units conform to the requirements of the Underwriters' Laboratories, Inc. Certificates of inspection shall be submitted in accordance with the requirements of NFPA 80 and 80A for fire doors exceeding the sizes for which label service is offered by Underwriters' Laboratories, Inc.

2.6 Manual Operation:

2.6.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counterbalanced to provide ease of operation while raising or lowering the curtain by hand. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.

2.6.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.

2.6.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on the crank to not over 35 pounds.

2.7 Motorized Operation:

2.7.1 Electric Operators: Operators shall be furnished complete with electric motor, reduction gears, magnetic brake, friction clutch, emergency release for manual operation, heavy-duty roller chain, controls, limit switches, and other accessories.

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2.7.2 Motor: Motor shall be totally enclosed, constant duty type, instantly reversible, capable of moving door at not less than 3/4 foot per second and designed for high frequency operation.

2.7.3 Controls: Each door motor shall have an enclosed reversing across-the-line type magnetic starter having thermal overload protection, solenoid-operated brake, limit switches, and one or more remote-control switches as required. The starter shall conform to NEMA ICS 2. Remote-control switches shall be of the three-button type with the buttons marked "OPEN", "CLOSE", and "STOP." CLOSE buttons shall be momentary-contact type requiring constant pressure to maintain motion of the door.

2.7.4 Safety Device: The bottom edge of electrically operated doors shall have a safety device that will immediately reverse the door movement upon contact with an obstruction. The safety device shall be installed across the entire width of the door and shall not substitute for a limit switch.

2.8 Hot-Dipped Galvanized Sheet Steel Surfaces shall be finished according to the requirements of ASTM A 525, G-90. Hardware items shall be galvanized according to ASTM A 153. Items galvanized after assembly shall comply with ASTM A 123.

2.9 Shop Prime Coat of Rust-Inhibiting Paint shall comply with Fed. Spec. TT-P-86.

2.10 Tracks for Overhead Doors shall be designed to accommodate 2-inch or 3-inch diameter galvanized steel rollers. Tracks shall be fabricated of 13-gauge galvanized steel. Track shall have springs at the end of track to cushion the door at the end of the opening motion.

2.11 Track Supports shall be angle iron, galvanized, and installed with cross-bracing to form a rigid construction.

2.12 Counterbalance shall be torsion-spring type for standard counter-balancing with tempered spring wire and continuous steel shaft. Provide cast aluminum and smooth cable drums with galvanized steel lift cables. Entire counterbalance assembly shall be mounted on ball bearings.

3.0 EXECUTION: Panels and frames that are field repaired shall be cleaned sufficiently for good paint adherence then primed to prevent further deterioration. Galvanized coatings that are damaged shall be repaired by the application of a high zinc dust content paint formulated for regalvanizing welds in galvanized steels.



SECTION 08375 HANGAR DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hangar doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

1. Size and arrangement of doors. Electrical and structural provisions for motor operators
2. Location and type of weather stripping, exterior covering, interior lining, and flashing
3. Location, spacing, size, and type of top guides and rails. Center-to-center dimension of leaves not less than 14 inches, and not less than 4 1/2 inches greater than total thickness of each leaf, including interior and exterior coverings. Where electrical trolley duct is required between leaves, provide additional 6 inches of clearance. Where cable system is required between leaves, provide additional one inch of clearance.
4. Location and type of personnel doors. Do not locate personnel doors between wheels and edge of hangar door leaf. Exact location to be determined by structural design of door leaf.
5. Location of bumpers and pulls.
6. That wheels will be required. Type, size, and number should not be shown since size and weight of doors will determine these.
7. Wind loads on both sides of doors and positive and negative deflection of top guides due to live loads.
8. Details of expansion joints in rails and top guides where building expansion joints occur.
9. Electrical service for motor operators, preferably 460 volts, 3-phase, 60-hertz, and location of power supply disconnect.
10. Festooned or draped cables or cable reels.
11. Access for installation, maintenance, and replacement of top rollers if hangar requires floating top rollers.
12. Door pockets: Minimum of 18 inches for doors up to 12 inches thick, 32 inches for doors more than 12 inches thick, should be allowed from center line of power leaf rail to farthest projection of interior wall of door pocket to accommodate operators and provide access.
13. Dimensions and details of tail doors, if required.
14. Minimum clearance of 4 inches between extreme faces of adjacent leaves in vicinity of interconnecting cables to allow sufficient space for cable sheaves and cable pickup.
15. Clearance of 4 inches between metal parts on vertical edges of leaves and between leaves and jambs which are weather-stripped.



16. Pocket depth, equal to width of widest door leaf, plus 3 feet net clearance for cable sheave brackets extending beyond trailing edge of leaves.

17. Rail drains for full length of bottom rails. This may be done with cross drains normal to the rails spaced about 20 feet o.c. emptying into continuous parallel floor drain. In cold areas it may be necessary to provide defrosting equipment below rails.

18. End of travel bumpers and bumper supports at end of door travel. Dimensions and locations should be in accordance with door manufacturer's approved drawings.

1.2 DESIGN REQUIREMENTS

1.2.1 Door Design [The hangar doors shall be designed by the manufacturer in accordance with the criteria specified.] Doors shall operate without binding, interference, or damage to weather-stripping. Doors shall fit closely and be free from warping.

1.2.2 Steel Design

1.2.3 Loading Design doors as a system to withstand an external wind load of 20 pounds per square foot (psf) or the design wind load indicated for the building, whichever is greater, and an internal wind load of not less than one-half of the external wind load. In both cases, the deflection shall not exceed the height of the door divided by 120. The deflection due to design wind load shall not exceed length divided by 120 for any door member. Fiber stresses due to combined dead load and wind load shall not exceed the recommended design stresses for the material used and type of loading sustained.

1.2.4 Connections Design connections at top and bottom guide rails to withstand an external and an internal wind load of not less than 33 psf, or the design wind load for the building, whichever is greater, and a seismic load equal to 0.5 times the weight of the door.

1.2.5 Cold-Formed Steel Members</TTL>__ Cold-formed steel main members and girts shall be not less than 1/4 inch thick.

1.5 DELIVERY, STORAGE, AND HANDLING Deliver materials which are not shop installed on the doors in original rolls, packages, containers, boxes, or crates bearing the manufacturer's name, brand, and model number. Store materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

PART 2 PRODUCTS

2.1 HANGAR DOORS

2.1.1 Structural Steel NOTE: Specify stainless steel only if local experience indicates that steel guides will rust and interfere with door operation. Include the following paragraphs in Section 05120, "Structural Steel.

1 Top Guides and Bottom Rails for Hangar Doors:

1.1 Top Guides: Maintain nominal elevation within plus or minus 1/4 inch and nominal center-to-center dimension within plus or minus 1/8 inch, with variation from nominal no greater than 1/8 inch in 20 feet. Joints of head guides are not required to be welded, but shim and grind so adjoining guide surfaces are not out of line more than 1/16 inch. Top guide tolerances shall be met after dead load is imposed on



building frame. [Top guide surfaces which will be in contact with rollers during door operation shall be stainless steel framing or structural members.]

1.2 Hanging Head Flashing: Galvanized steel, not lighter than 18 gage, reinforced as required. Coordinate with hangar door manufacturer. Show exact location and configuration on top guide shop drawings. Top guide and head flashing system shall be shop assembled to verify accuracy of fit and fastener location, and disassembled for shipping. Install head flashing after doors are in place.

1.3 Bottom Rails: Standard A.S.C.E. or A.R.E.A. weighing not less than [_____] pounds per yard. Do not install rails until top guide system has been installed. Anchor rails as indicated. Set rails to elevation within plus or minus 1/4 inch, with variations from elevation no greater rate than 1/8 inch in 20 feet. Nominal design relationship between top guides and bottom rails to be maintained without exception. Center-to-center dimensions of bottom rails to be maintained within plus or minus 1/8 inch with variation from nominal no greater than 1/8 inch in 20 feet. Weld rail joints and grind smooth or provide with splice plate in accordance with ASCE standards AISC S335 and ASTM A 36/A 36M

2.1.2 Formed Steel AISI SG-673

2.1.3 Sheet Steel ASTM A 569/A 569M hot-rolled steel sheet, commercial quality, or ASTM A 366/A 366M cold-rolled steel sheet, commercial quality.

2.1.4 Galvanized Steel ASTM A 653/A 653M, coating designation G 90 galvanized steel sheet, commercial quality.

2.1.5 Exterior Covering NOTE: Choose one of the following options. NOTE: Designer's options. Use the first paragraph if the covering is to be provided by the hangar door manufacturer, as when new doors are required for an existing building. Use the second paragraph if the hangar doors are a part of a new building which will have preformed metal siding. Ascertain that the project specification contains the referenced section and that the section is edited to include the covering for the hangar doors. [Flat [sheet steel] [galvanized steel sheet], not lighter than 13 gage [Preformed metal siding as specified in Section 07410, "Metal Roof and Wall Panels."]

2.1.6 Interior Covering NOTE: Choose one of the following options.</NPR>_<AST>_</NTE><NTE>_<AST>_</NPR>NOTE: Designer's Options. Use the first paragraph if the covering is to be provided by the hangar door manufacturer, as when new doors are required for an existing building. Use the second paragraph if the hangar doors are a part of a new building which will have preformed metal liner panels. Ascertain that the project specification contains the referenced section and that the section is edited to include the covering for the hangar doors.[Flat [sheet steel] [galvanized steel] liner sheets, not lighter than 16 gage. [Preformed metal siding is specified in Section 07410, "Metal Roof and Wall Panels."]

2.1.7 Insulation NOTE: Choose one of the following options.</NPR>_<AST>_</NTE><NTE>_<AST>_</NPR>NOTE: Designer's Options. Use the first paragraph if the insulation is to be provided by the hangar door manufacturer, as when new doors are required for an existing building. Use the second paragraph if the hangar doors are a part of a new building which will have preformed metal siding and liner panels. Ascertain that the project specification contains the referenced section and that the section is edited to include the insulation for the hangar doors. NOTE: Specify same "U" value as required for walls of the building. Specify STC value as required to keep noise level within the hangar at not more than 85 dB

a. The value will depend upon type of aircraft, apron traffic patterns, and proximity of run-up areas. [Provide insulation that:

a. Contains no asbestos;

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- b. Is permanently secured in place behind the exterior covering; and
- c. Has a flame spread rating of 75 or less and a smoke-developed rating of 100 or less when tested in accordance with <RID>ASTM E 84</RID>.</ITM>__ Do not use cellular plastics as exposed finish material. The doors shall have an air-to-air "U" value of not more than [_____] and a sound transmission class (STC) of not less than [_____.] [Batt or blanket insulation as specified in Section 07212, "Mineral Fiber Blanket Insulation

2.1.8 Hardware</TTL>__ Provide hangar door hardware to accommodate actual dead loads plus wind loads specified. Provide top guide rollers, bottom wheels, interleaf bumpers, tractor pulls, track cleaners, and top bumpers as required for a complete and operational installation.

2.1.8.1 Wheel Assemblies Bottom wheels shall be of steel plate or cast steel, having a minimum tread diameter as required for the actual wheel loading. Where the height-to-width ratio of the door leaf exceeds three, wheel assemblies shall be vertically adjustable. Construct wheel assemblies to permit removal of the wheel without removing the door leaf from its position on the rail.

a. Treads: Machine wheel treads concentric with bearing seats. The clear distance between flanges shall not exceed the width of the rail by more than 1/8 inch at the tread nor more than 1/4 inch at the edge of the flange. Machine internal bearing seats accurately for a press fit. Heat treat wheels 18 inches or greater in diameter to obtain a rim hardness of 320 Brinell.

b. Wheel bearings: Provide tapered roller or spherical bearings, either internal or cartridge type, arranged so that both horizontal and vertical loads shall be transferred to the rail only through the bearing. Bearings shall be tightly sealed and equipped with high-pressure grease fittings.

2.1.8.2 Fixed Pancake Top Guide Rollers NOTE: Specify stainless steel rollers only if local experience indicates that steel rollers will rust and interfere with door operation. Horizontal type; each with single or double steel rollers of a suitable diameter and thickness for satisfactory performance under the designated load conditions and top guide system used. Provide permanently lubricated bearings. [Rollers shall be stainless steel.]

2.1.8.3 Vertical Floating Head Top Guide Rollers Provide top-roller assemblies to:

- a. Move up and down within the specified live load positive and negative deflection of the roof in the vicinity of the door opening;
- b. Allow easy removal through the top of the guide system; and
- c. Include both horizontal and vertical rollers built into a frame which is connected in such a manner as to transmit the specified wind loads from the door to the hangar structure and to prevent disengagement of the door from the top guide. [Rollers shall be stainless steel.]

2.1.9 Personnel Doors</TTL>_<NTE>_<AST>_<NPR>NOTE: Personnel doors, their frames, and hardware shall be specified in the respective sections of the project specification. Provide self closing door hardware.</NPR>_<AST>_</NTE>_ The hangar door manufacturer shall provide structural frames and electrical interlock for personnel doors. __<SPT =2.1.9.1>

2.1.9.1 Doors and Frames Specified in Section 08110, "Steel Doors and Frames."

2.1.9.2 Hardware for Personnel Doors Specified in Section 08710, "Door Hardware."

2.1.9.3 Electrical Interlock Provide each personnel door with an electrical interlock switch to prevent motor operation of the leaf or group in which it is located when the personnel door is open. Provide an



identified indicator light at each door leaf control station indicating when the personnel door is in the open position.

2.1.10 Weather Stripping Provide adjustable and readily replaceable material. Provide [as indicated] [on vertical edges, sills, and heads] to afford a weathertight installation.

2.1.10.1 Neoprene Use flap-type, two-ply, cloth-inserted neoprene or extruded, double flap, single or dual opposed solid neoprene material on vertical edges and sills. The two-ply material shall have a minimum thickness of 1/8 inch and shall be retained continuously for its full length and secured with rust-resistant fasteners 12 inches o.c. Extruded weather stripping with heavy center section shall be attached at 12 inches o.c., but continuous bar may be omitted. Clearance between metal parts on vertical edges of leaves and between leaves and jambs which are to be weather-stripped shall be as indicated.

2.1.10.2 Metallic Form head weather stripping material between each leaf and the top guide system of not lighter than 18 gage galvanized sheet steel or flap-type, cloth-inserted neoprene, as indicated.

2.1.10.3 Hanging Head Flashing NOTE: Delete paragraph if hangar doors have vertical floating top rollers. Hanging head flashing must be designed and fabricated to accommodate total positive and negative deflection of roof in vicinity of door opening. Stiffened hanging head flashing shall be designed to fasten to top guides; material shall be 13 gage galvanized steel stiffened by supporting frames to adequately withstand specified wind loads without permanent deformation. Material must be furnished and installed by same trade that furnishes top guide system, so preparation for fasteners can be done at fabrication shop. However, to minimize possibility of damage to the material, installation must be done after doors are in final position on rails. Provide with the top guide system specified in Section 05120, "Structural Steel." Provide cloth-inserted neoprene weathering fastened to top of door leaves to engage the head flashing when doors are closed.

2.1.11 Fasteners Either zinc-coated or cadmium-plated steel.

2.1.12 Sealant Single-component or multicomponent elastomeric type conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Provide a sealant that has been tested on the types of substrate to which it will be applied.

2.1.13 Primer Red iron oxide, zinc oxide type, SSPC Paint 25.

2.1.14 Starters Provide magnetic reversing starters in NEMA ICS 1, Type 12 enclosures equipped with access door-controlled, fused safety disconnect switches. Starters shall be factory wired with overload and under-voltage protection, mechanical and electrical interlocks, auxiliary contacts, relays and timing devices as required, control circuit transformers, and a numbered terminal strip. The control circuit transformer shall reduce the voltage in the control circuits to 115 volts or less, and shall conform to UL 506

2.1.15 Electrical Provide conduit, wire, flexible cables, boxes, devices, and accessories [, and install trolley duct,] under Section 16402, "Interior Distribution System." If permanent electrical power is not available when door installation is complete, provide temporary power under Section 16402, "Interior Distribution System," for testing and adjusting the doors.

2.2 FABRICATION

2.2.1 Doors

2.2.1.1 Frames and Framing Door leaves shall be of welded or bolted construction. Joints shall develop 100 percent of the strength of the framing members. Vertical members shall be continuous throughout the height of the door. When required, prepare splices to facilitate field assembly in accordance with standard

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practice. Frames and framing members shall be true to dimensions and square in all directions; no leaf shall be bowed, warped, or out of line in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Provide diagonal bracing so that the completed leaf assembly will be braced to withstand shipping, assembly, and operational loads. Exposed welds and welds which interfere with the installation of various parts such as cover sheets shall be ground smooth.

2.2.1.2 Exterior Covering and Interior Liner Sheets</TTL>__ Flat sheets shall be fastened to the frame either by edge welding, plug welding, or threaded fasteners 12 inches o.c. Where flat sheets are attached as either exterior covering or interior liner sheets, the clear unsupported area shall not exceed 25 square feet. Make edges of exterior sheets weathertight with sealant

2.2.2 Locking Devices Do not provide locking devices on motor-operated hangar doors.

2.2.3 Tractor Pulls Provide tractor pulls so that leaves can be towed by a tractor or similar equipment in the event of power failure.

2.2.4 Track Cleaners Provide a device to clear debris from the rail head and wheel flange grooves as the leaf is moved.

2.2.5 Insulation Secure insulation to doors with clips, studs, or adhesive. Protect insulation within 8 feet of floor with steel liner sheets secured to framing 12 inches o.c. at edges with zinc-coated, self-tapping screws.

2.2.6 Cable System for Group Doors The minimum size for the cable which interconnects the leaves shall be 3/8 inch; the cables shall be improved plow steel with lubricated hemp centers or wire rope cores. Sheaves over which the cables operate shall have a diameter of at least 18 cable diameters and either sealed ball-or roller-type bearings or graphite bronze bearings of a sufficient capacity for the operating loads. Grease fittings shall be provided for the sheave bearings unless permanently lubricated bearings are used.

2.3 OPERATION</TTL>_<NTE>_<AST>_<NPR>NOTE: Type of operation will depend upon use and configuration of the hangar. Delete inapplicable paragraphs.

2.3.1 Hangar Door Types</TTL>__ Hangar doors shall be [unidirectional] [biparting] [as indicated.]. __

2.3.1.1 Individually Operated Doors</TTL>__ Each door leaf shall have a separate, traction-drive operating unit driving one or more of the bottom wheels. Each leaf shall have a motor-mounted, spring-set, solenoid-released motor brake. Each leaf shall move independently of the other leaves. Provide doors that require operating personnel to walk with the leaf as it moves.

2.3.1.2 Floating Group Doors</TTL>_<NTE>_<AST>_<NPR>NOTE: Consider visual appearance when using the anchored or wraparound cable system. The cables used to move the door leaves are exposed to view.</NPR>_<AST>_<NTE>_ Each group of three or more leaves shall have a separate, traction-drive operating unit located in each end leaf of the floating group doors, which drives one or more wheels of the end leaf, and a wraparound cable system on the intermediate leaves coupled to each end leaf; or an interleaf pickup system. Movement of either end leaf shall allow stacking and unstacking of the other end and shall also allow intermediate leaves to move in concert. The group of leaves traveling abreast may then be positioned as desired in the opening. Provide necessary cables, fittings, cable sheaves, housings, guards, pickups, brackets, anchors, and miscellaneous hardware.

2.3.1.3 Anchored Group Doors</TTL>__ Each group of leaves shall have a traction-drive operating unit located in the lead leaf of the group and driving one or more wheels of the lead leaf. [The leaves in each group shall start to move at the same time and arrive at their fully open or fully closed positions



simultaneously]. Provide necessary cables, fittings, sheaves, housings, guards, pickups, brackets, anchors, and miscellaneous hardware.

2.3.2 Operating Units</TTL>_<NTE>_<AST>_<NPR>NOTE: Delete "lead" for individually operated doors. Leave in for group doors.</NPR>_<AST>_<NTE>_ Each operating unit shall move its [lead] leaf at a speed of approximately 60 feet per minute at zero wind load conditions and to be operable up to and including a maximum wind load of 8 pounds per square foot</ENG>. The operating units shall consist of either a separate motor and gear reducer or a gearhead motor, high-speed shaft brake, and necessary roller chains and sprockets. The systems shall be provided with overload protection for the drive units and a means for emergency tractor towing operation. __<ITM INDENT=-0.33>a. Motors shall be single speed, squirrel-cage type of sufficient size to operate the leaves under zero wind load conditions at not more than 75 percent of their rated capacity.</ITM>__<ITM INDENT=-0.33>b. Gear reduction units shall allow a reversal of effort through the gears without damage to the units.</ITM>__<ITM INDENT=-0.33>c. Operating mechanisms shall be covered on the interior of the leaf by a hinged 16 gage flat steel cover.

2.3.3 Braking Systems</TTL>__ Braking systems shall be designed to ensure stoppage of the leaves under normal, dry rail conditions within the safety edge overtravel limit. The braking systems shall be either a magnetic, spring-set, solenoid-released brake or hydraulic type. Provide a hand release to release the brake when it becomes necessary to move the leaf with an outside force. The hand release shall be an automatic reset type so that the brake will be operable during subsequent electrical operation of the door.

2.3.4 Controls</TTL>__ Doors shall be controlled by constant pressure push buttons mounted on the door leaves. Removing pressure from the button shall stop the movement of the leaves. The control equipment shall conform to <RID>NEMA ICS 1</RID> and <RID>NEMA ICS 2</RID>. Interior push buttons shall be mushroom head type, mounted in heavy-duty, oil-tight enclosures conforming to <RID>NEMA ICS 6</RID>, Type 13, except that enclosure for reversing starter with disconnect switch shall be Type 1 or Type 12. [Exterior push buttons shall be in watertight enclosures conforming to <RID>NEMA ICS 6</RID>, Type 4.]

2.3.4.1 Push Buttons for Individually Operated Doors</TTL>__ The leaves mounted on the outer rails shall have the push buttons mounted on the exterior face; the leaves on the inner rails shall have the buttons mounted on the interior face; and the leaves on the middle rails shall have the buttons mounted on both the exterior and interior faces. The button at each edge of a leaf shall allow the leaf to travel with that edge as the leading edge only. The controls shall not be reversible. Location of each control button shall be as indicated.

2.3.4.2 Push Buttons for Floating Group Doors</TTL>__ Each group shall be controlled by push button stations mounted at each end of each group of leaves. Stations shall contain one button for stacking the leaves, one button for unstacking the leaves, and a third button for moving the leaves in a group. The leaves mounted on the outer rail shall have the push buttons mounted on the exterior face. The leaves mounted on the inner rail shall have the push buttons mounted on the interior face. Location of each control station shall be shown on manufacturer's drawings.

2.3.4.3 Push Buttons for Anchored Group Doors</TTL>__ Each group shall be controlled by a two-button push button station marked "OPEN" and "CLOSE" mounted near the inside leading edge of the lead leaf.

2.3.5 Limit Switches</TTL>__ Provide limit switches to prevent overtravel and bumping. Safety edges shall not be used as limit switches.

2.3.5.1 Plunger-Type Limit Switches</TTL>__ Provide [at each edge of each leaf of individually operated doors] [at each end of each group of floating group doors]. Limit switches shall be actuated by 3/4 inch diameter stainless steel rods of adjustable length, guided at both ends with nonmetallic bearings

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and with tape-type constant force springs to return the rods to their normal position after actuation. The actuating rods shall have sufficient overtravel so that the leaves cannot bump one another or any portion of the building or be damaged when being towed. Each rod shall be adjustable 6 inches plus or minus from its normal position. __</SPT =2.3.5.1><SPT =2.3.5.2>

2.3.5.2 Lever Arm Type Limit Switches</TTL>__ Provide for anchored group doors to stop the travel of each group in the fully open and fully closed positions. The limit switches shall be: __<ITM INDENT=-0.33>a. Positive acting, snap action, lever arm type with actuating cams designed with sufficient overtravel to permit the group to come to a complete stop without overtraveling the limit switches.</ITM>__<ITM INDENT=-0.33>b. Mounted on the leaves, and the actuating cams mounted either on the top guides or on adjacent door leaves.</ITM>__</SPT =2.3.5.2></SPT =2.3.5><SPT =2.3.6>

2.3.6 Safety Edges</TTL>_<NTE>_<&AST>_<NPR>NOTE: Edit to suit type of door operation required.</NPR>_<&AST>_<NTE>_ Provide fail-safe safety edges on [each edge of each leaf of individually operated doors] [each leading and trailing edge of drive leaves for floating group doors] [the leading edge of the drive leaf of anchored group doors] from one inch above the floor to the top of the door leaf. For leaves 12 inches thick or less, provide a single run of safety edge. For leaves over 12 inches thick, provide a double run of safety edge spaced to provide the maximum degree of safety in stopping the leaves. __<ITM INDENT=-0.33>a. Design: Provide safety edges to provide a minimum of 3 1/2 inches of over-travel after actuation until solid resistance is met. Safety edges shall be electric.</ITM>__<ITM INDENT=-0.33>b. Operation: Actuation of the safety edge on leading edge of a group of leaves shall stop movement of the group. Actuation of a safety edge shall lock out the motor control in the direction of travel until reset, but shall permit the door to be reversed away from the obstruction which tripped the safety edge. Safety edges shall be alive only when doors are moving. Safety edges shall be reset by moving doors away from the obstruction. The lower portion of the safety edges to a height of approximately 5 feet shall be independently removable for convenience in servicing or repair. The remainder of the edge may be in one piece up to a maximum of 20 feet.

2.3.6.1 Electrical Safety Edges</TTL>__ Connect the safety edge in series with the necessary relays and resistors to make the system complete. The service shall be not more than 24 volts and the circuit shall be normally energized so that the malfunction of any of the component parts will make the door inoperative. __</SPT =2.3.6.1></SPT =2.3.6><SPT =2.3.7>

2.3.7 Warning Device</TTL>__ Provide a clearly audible signal on each [individually operated leaf] [group of leaves]. The warning device shall:

- a. Operate when the push button is actuated for movement of the door in either direction;
- b. Sound 5 seconds before the door moves, and while the door is moving; and
- c. Consist of not less than a 6 inch diameter bell or equivalent decibel-rated horn, loud enough to be heard in the hangar and on the apron.

2.3.8 Emergency Operation</TTL>__ Hangar doors[, including tail doors,] shall be constructed and equipped so that they can be operated-manually or by tractors from the hangar floor in case of power failure. Manual operation of hangar doors shall be designed to avoid damage to safety edges. __</SPT =2.3.8><SPT =2.3.9>

2.3.9 Electrical Work</TTL>_<NTE>_<&AST>_<NPR>NOTE: Insert the following into Section 16402, "Interior Distribution System."</NPR>__<NPR>"HANGAR DOORS: Provide field wiring [and trolley duct installation] for hangar doors under this section in accordance with door manufacturer's written instructions, drawings and diagrams, and NFPA 70 and NEMA ICS 1. Provide conduit, wiring, boxes,



cables, devices, and accessories under this section. If permanent electrical power is not available when door installation is complete, provide temporary power for testing and adjusting doors for proper operation. [Trolley ducts will be furnished by door manufacturer and installed under this section in accordance with door manufacturer's approved drawings.] [Draped or festooned cables or cable reels shall be provided under this section. Cable shall be extra-flexible Type SD, and shall have a spring-loaded, automatic take-up reel, coil-cord, draped cable, or equivalent device.] [as indicated.] "</NPR>_<AST>_</NTE>_

The door manufacturer shall provide the proper electrical equipment and controls built in accordance with the latest NEMA standards. Equipment, control circuits, and safety edge circuits shall conform to NFPA 70. Where located 18 inches or less above the floor, they shall be explosion-proof as defined in NFPA 70, Article 513. Manual or automatic control devices necessary for motor operation of the doors shall be provided, including push button stations, limit switches, combination fused disconnect switches and magnetic reversing starters, control circuit transformers, relays, timing devices, warning devices, and trolley ducts with collectors or trolleys.

2.3.9.1 Trolley Ducts</TTL>_<NTE>_<AST>_<NPR>NOTE: Individually motor-operated doors and floating group doors should always be provided with a trolley duct system to bring power to door leaves. Anchored group doors, if opening width is not excessive, can be equipped with draped or festooned cables or cable reels. If opening width exceeds 120 feet, a trolley duct system should be used. Trolley duct systems should be specified to be furnished by door manufacturer but installed under Section 16402, "Interior Distribution System" in accordance with door manufacturer's drawings. Only door manufacturer is properly qualified to know where to place trolley duct so there is adequate clearance and noninterference. Provide one or more runs of trolley duct as required for the door system provided. Ducts shall have solid copper conductors in a protective steel [or polyvinyl chloride] housing. Locate ducts as shown on door manufacturer's drawings. Provide adequate clearances in the top guide system for the ducts

a. Each run shall consist of the required number of sections of straight track, a section of dropout track, feed boxes, end caps, couplings, hangers, and other accessories to make the system complete and workable. Provide expansion tracks in each run where the system crosses a building expansion joint in the roof construction and in the top guides

b. Furnish one track-supported tandem trolley or self-supporting collector for each [individually motor-operated door] [group of doors], complete with spring-loaded brush contacts. Provide trolley pulling brackets and corrosion-protected chains attached from each side of the pulling bracket to each side of the tandem trolley or support bracket for self-supporting collectors

2.3.9.2 Electrical Cables NOTE: Draped or festooned cables and cable reels should be specified to be furnished and installed under Section 16402, "Interior Distribution System." Flexible cables or cable reels shall be provided under Section 16402, "Interior Distribution System," in accordance with the door manufacturer's approved drawings and wiring diagrams.

PART 3 EXECUTION

3.1 PROTECTIVE COATINGS

After fabrication, clean metal surfaces in accordance with SSPC SP 6 (Commercial Blast).

3.1.2 Shop Painting After cleaning, coat steel surfaces other than machine-finished parts with priming paint. Keep paint off of finished bearing surfaces. Before assembly, prime surfaces that will be inaccessible after assembly. Handle painted materials with care to avoid scraping or breaking the protective film. Make match-marks on painted surfaces only.

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3.2 ERECTION Assemble doors and accessories in accordance with approved shop drawings. Do not erect doors until the work of other trades in preparing the opening has been completed, the hangar roof is under full dead load, and the top guide and rail systems are within specified tolerances. After completing erection and before starting field painting, clean interior and exterior door surfaces. Clean abraded surfaces, field welds, and field bolts; and coat with priming paint. Field painting as specified in Section 09900, "Paints and Coatings."

3.3 FIELD QUALITY CONTROL

3.3.1 Manufacturer's Field Services Provide an authorized representative of the door manufacturer to supervise erection of doors.

3.3.2 Tests Immediately after the door installation is complete, the door manufacturer or his representative shall perform a complete operating test in the presence of the Contracting Officer. Correct defects disclosed by the test. Retest the doors and adjust them until the entire installation is fully operational and acceptable to the Contracting Officer



SECTION 08379 WOOD SAFETY GLASS DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood safety glass doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Safety Glass shall be clear, heat-strengthened, and fully tempered plate or float glass in compliance with the requirements of ANSI Z97.1, 16 CFR 1201, and the Safety Glazing Certification Council. Provide tinted or reflective tempered safety glass as required.

2.2 Wood for Door Frame, Stiles, and Rails shall be Douglas fir, redwood, cedar or select hardwood. Exposed wood surfaces shall be sanded, cleaned, and factory-primed ready for final finish coat. PVC clad wood safety glass doors shall be provided as required.

2.3 Provide Factory-Primed and Finish-Painted Wood Surfaces when no other field painting is required.

2.4 Hardware shall be manufacturer's standard style and designed for the door swing, door size, glass thickness, door weight, and area for access and egress. Hardware fittings of door shall match the hardware finish of the adjacent area.

2.4.1 Provide Heavy-Duty Hardware in heavy pedestrian or high traffic areas.

2.4.2 Door Push-Pull Sets or Handles and Hardware Accessories shall be manufacturer's standard design. Provide floor closer with selective hold-open feature. Locks and deadbolts shall be keyed from both sides of bottom door rail or strike side of door stile.

2.4.3 Where Aluminum Hardware Finish is required, aluminum finish shall be anodized.

2.4.4 Panic Exit Devices or Electric Strikes shall be furnished where required.

3.0 EXECUTION: (Section not used.)



SECTION 08385 SOUND RETARDANT DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material for sound retardant doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General:

2.1.1 Each Door Location shall be complete with frame and integral acoustical type hardware accessories, mounting, and installation components.

2.1.2 Door Unit shall conform to ASTM E 90 to achieve the required Sound Transmission Classification (STC) and certified according to ASTM E 413.

2.2 Steel Sound Retardant Doors: Door assembly shall conform to SDI-100 and ANSI A115.

2.3 Wood Sound Retardant Doors: Door assembly shall conform to Architectural Woodwork Institute AWI-01 Custom Grade and ASTM E 90.

2.4 Perimeter Seals and Door Bottoms Seal material for heads, jambs, and door bottoms shall be a closed-cell, expanded cellular rubber conforming to ASTM D 1056, Type S, Grade SBE-42 or SCE-42.

3.0 EXECUTION: Door units shall be installed complete with all necessary anchors and inserts, hardware, and other accessories. Upon completion of installation, doors shall be free from warp, twist, or distortion. Perimeter seals and automatic door-bottom seals shall be installed and adjusted to provide positive compression contact with the entire sealing surface with no gaps, openings, or breaks. Hinges or hardware shall not distort or pinch the perimeter seal during operation of the door.



SECTION 08386 ALUMINUM SAFETY GLASS DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum safety glass doors. Products shall match existing materials and/or as shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aluminum Safety Glass Doors shall be manufacturer's standard and shall comply with the requirements of ANSI Z97.1, Fed. Spec. DD-G-1403, and the Safety Glazing Certification Council (SGCC) standards for heat strengthened and fully tempered safety glass.

2.2 Safety Glass Doors shall have clear tempered safety glass and shall be manufacturer's stock design in standard sizes. Glazing for door tolerance shall be dimension plus 1/16 inch, minus 1/8 inch. All door glazing shall be set in aluminum frames of sufficient strength to withstand heavy duty use.

2.3 Finish for Aluminum Frames shall be anodized AA-C22A 41RIX or AA-M21C22A 42RIX, as required, minimum 0.7 mil thickness with clear methacrylate lacquer coating, minimum 0.5 mil thick.

2.4 Hardware shall be manufacturer's standard finish to match aluminum frame door stiles and rails. Push-pull set shall be manufacturer's stock design flat plate units, approximately 6 inches by 10 inches, engraved with "push" and "pull." Custom designed push-pull (handles) set and required fittings shall be provided where required.

2.4.1 Lockset with Deadbolt in lower rail engaging cut-out in threshold shall be keyed from both sides. Where required, provide a lockset with deadbolt in lock side of glass door, keyed from both sides.

2.4.2 For Pairs of Doors, provide a deadbolt in lower rail of each door that will engage a cut-out in the threshold and key from both sides.

2.4.3 Where Floor Recessed Checking Floor Hinges are required, provide top pivot hardware. Where overhead closers are required, provide bottom pivot hardware. Provide checking floor hinges with sealed floor box, finished cover plate, separate adjustment screws for checking speed, and hold open device.

2.5 Threshold shall be manufacturer's standard, finished to match door rails and sized to suit door opening.

2.6 Anchorages and Fastenings shall be manufacturer's standard concealed. Finish heads of exposed fasteners shall match finish of adjacent metal surfaces.

2.7 Locate and Provide Holes and Cutouts to receive hardware before tempering safety glass. Do not permit any cutting, drilling, or other glass alterations after tempering operation.

3.0 EXECUTION: (Section not used.)



SECTION 08390 SCREEN AND STORM DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal, aluminum or wood screen and storm doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 The Manufacturer shall be a recognized producer of screen and storm doors. All work performed shall meet the requirements of local codes and regulations.

2.3 Hollow Metal Combination Storm and Screen Doors: Doors shall be flush foam insulated panels capable of receiving removable screen or glass inserts. Doors shall be not less than 20-gauge steel, minimum 1-3/8 inch thick, and minimum 3-1/2 inch stiles and rails. Screen insert shall be aluminum wire-cloth or plastic coated glass fiber screening. Glazing shall be 1/4 inch thickness.

2.4 Aluminum Combination Storm and Screen Doors: Doors shall consist of a master frame with two intermediate horizontal rails, one fixed metal panel, and two glass and two screen removable insert panels. Master frame shall be a minimum 1 inch thick and stiles shall be a minimum 2-3/4 inches wide. Doors shall have a mill finish.

2.5 Wood Combination Storm and Screen Doors: Doors shall be manufacturer's standard solid core door not less than 1-3/4 inches thick with 5-inch minimum stiles and top rail. Upper panel shall be arranged to receive removable glass and screen inserts. Screen insert shall be aluminum wire-cloth or plastic coated glass fiber screening. Glazing shall be 1/4 inch thickness.

2.6 Door Accessories: Doors shall be reinforced to receive, and shall be provided with a spring-loaded chain door stop, a latch with a night lock, a hydraulic closer, 1-1/2 pair butts, door pull, and an adjustable sweep with a vinyl seal. Doors shall be finished as specified for hollow metal doors.

3.0 EXECUTION: Doors shall be securely attached to adjacent materials. Doors shall be plumb and true without warping.



SECTION 08410 ENTRANCES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of entrance assemblies. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Entrance shall be a complete unit produced by one manufacturer recognized as producer of glass entrance panels with glass doors, weather-stripping, and hardware on operating door panel.

2.2 Extrusions for Door Construction shall be AA 6063-T5 alloy with clear anodized 204-R1-A1 finish and 22,000 psi ultimate tensile strength. Main member extrusions shall be not less than 0.125 inch in wall thickness.

2.3 Aluminum Sheet Material for Door Construction shall be plain flat sheet for exposed faces of flush and panel doors of not less than 0.062-inch thickness.

2.4 Fasteners shall be aluminum, stainless steel, or other non-corrosive metal fasteners compatible with the framing material. Exposed fasteners shall be Phillips flat-head screws matching fastened material.

2.5 Steel Reinforcement and Brackets shall be manufacturer's special formed units with 2.0 ounce hot-dip zinc coating complying with ASTM A 153, applied after fabrication.

2.6 Frames shall be extruded tube sections manufactured from AA 6063-T5 alloy with clear anodized 204-R1-A1 finish, not less than 0.125 inch in thickness. Frames to receive fixed glass shall have removable glass stops and beads.

2.7 Door shall be fabricated from extruded aluminum seamless tubular shapes. Top and bottom rails shall be welded to stiles with corner reinforcement. Joints shall be milled to hairline watertight fit. Welding shall be done on concealed surfaces and shall not blemish exposed surfaces. Door shall have extruded aluminum snap-in type glass stop with integral vinyl glazing insert.

2.8 Weather-stripping shall be manufacturer's standard compression type neoprene gasket. Weather-stripping shall be easily replaced without special tools. Weather-stripping at meeting rails of pairs of doors 08412-shall be adjustable. Weather-stripping shall be applied to stiles, heads, and bottoms of doors.

2.9 Clear Glass shall be ASTM C 1048, fully tempered, un-coated, transparent, Class 1 in required thicknesses. Products shall have been tested according to ASTM C1048 and for impact strength in accordance with CPSC 16 CFR, Part 1201 for Category II materials.

2.10 Hardware Shall include but not be limited to; Push-Pull set, active and inactive leaf locksets, exit devices, and thresholds for a complete functional installation.

3.0 EXECUTION: Entrance assemblies shall be installed or repaired by the manufacturer or an authorized representative.



SECTION 08471 REVOLVING DOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of revolving doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Door units shall be standard manufacturers products fabricated from extruded aluminum tube sections of AA 6063-T5 alloy, clear 204-RI-A1 anodized finish. Door framing members shall be 0.375-inch minimum wall thickness. Enclosure framing members shall be 0.125-inch minimum wall thickness. Snap-in type glass stops shall be minimum 0.050-inch thickness.

2.1 Fabricate Assembly with welded and mechanical construction; concealed, reinforced joints; and corners with flush hairline joints.

2.2 Provide Weatherstripping at stiles, head, and bottom of door wings.

2.3 Door Wings shall be arranged to collapse and fold to the emergency exit position when a pressure of not less than 100 pounds nor more than 140 pounds is applied to the outer door stile at the push bar height of 3 feet, 10 inches. No visible external braces or collapsing plates will be permitted.

2.4 Door Unit shall be provided with a mechanical floor-mounted speed control sealed unit to control the revolving door up to a maximum of 12 revolutions per minute. Door shall be provided with wall push plate switch for slowed operation and control mat safety device. Unit shall allow for manual operation when power is off.

2.5 All Work Performed shall meet the requirements of local codes and regulations.

2.6 Safety Glass shall be category II materials complying with testing requirements in 16 CFR 1201 and in ANSI Z97.1.

3.0 EXECUTION: Doors shall be installed or repaired by the manufacturer or an authorized representative and adjusted for smooth and even rotation.



SECTION 08512 METAL WINDOWS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel, stainless steel, and bronze windows. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fixed Windows, Hopper Vent: Window units shall comply with SWI-01, The Specifier's Guide to Steel Windows, for standard intermediate windows with bottom hinged, swing-in type ventilator hopper sash. Bottom rails of ventilators shall have an outside drip. Hardware shall be manufacturer's standard type for each window. Ventilator shall have one pair of hinges or pivots, two stay arms, and a cam-type lever handle latch. Sash and hardware shall be designed to permit easy removal of sash from inside the building.

2.2 Fixed Windows: Fixed windows shall comply with the requirements of SWI-01, for standard intermediate windows.

2.3 Projected Windows: Projected windows shall comply with the requirements of SWI-01, for commercial projected windows, with project-out type ventilators, top-hinged.

2.4 Continuous Top-Hinged Windows: Continuous windows shall comply with SWI-01 continuous type with manual operation.

2.5 Casement Windows: Casement windows shall comply with SWI-01, for standard intermediate windows. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type with adjustable operating arms. A continuous drip molding shall be provided above operable sash. Abutting units or combination units shall have manufacturer's stock standard mullion.

2.6 Awning Windows: Awning windows shall comply with the SWI-01, for architectural awning intermediate type frame and ventilator members. Ventilators in same frame shall operate in unison. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type, with adjustable operating arms. The operator shall securely close the ventilators without using additional locking devices. Ventilators shall be designed to close and be weathertight to adjoining ventilators or frame. Window frame shall be designed with rebate to receive screens.

2.7 Reversible Windows: Reversible horizontal pivoted windows shall comply with SWI-01, for commercial type.

2.8 Hinged Emergency Windows: Hinged emergency type windows shall comply with SWI Recommended Specifications for Steel Windows, for commercial type, with manual operation side- or hinged for swing-out emergency exit, pivots or hinges for 90 degrees swing-out. Window shall be equipped with push-release type lever operator on window latch, complying with the requirements of local regulations for "panic hardware".

2.9 Double/Single Hung Windows: Double and single hung windows shall comply with SWI Recommended Specifications for steel windows for commercial type. Two spiral type removable sash balances shall be provided for each sash. Balances shall be adjustable without removing sash from frame

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and without use of special tools. Each window 40 inches wide or less shall be provided with one sweep sash lock. Each window over 40 inches wide shall be provided with two sweep sash locks. Lower sash shall have one continuous integral lift at the bottom of the sash. The upper sash shall have a continuous integral pull down member on the meeting rail.

2.10 Operating Hardware: Hardware shall be provided for all operable, ventilating sash units of manufacturer's standard for the function of each individual window type specified. All operable sash shall have a latch or locking device. Hardware shall be securely attached to the window with noncorrosive bolts or machine screws.

2.11 Miscellaneous Hardware shall comply with ANSI A156.16. All metal hardware for stainless steel windows shall be non-corrodible. All hardware items for bronze windows shall match window finish.

2.12 Screens: Insect screens shall be full size of the operable unit. Screens shall comply with SWI-01 and shall have removable splines of steel or vinyl. Screening shall be 18 x 14 mesh, complying with Fed. Spec. RR-W-365 for wire fabric or Fed. Spec. L-S-125, Type II.

2.13 Weatherstripping shall be the standard type for use with the window unit supplied and shall be easily replaceable.

2.14 Materials for Steel Windows shall comply with the requirements of the following:

- a. Sheet steel: ASTM A 569.
- b. Zinc-coated steel: ASTM A 90 or A 123.
- c. Zinc-coating on hardware: ASTM A 153.
- d. Corrosion-resistant steel: ASTM A 693.

2.15 Materials for Stainless Steel Windows shall comply with the requirements of ASTM A 167.

2.16 Materials for Bronze Frames shall comply with the requirements of ASTM B 96, ASTM B 100, ASTM B 150 or ASTM B 169.

3.0 EXECUTION: Window units shall be installed complete with all necessary anchors, hardware, and other accessories and shall be plumb, square, and level in alignment, and braced and stayed properly to prevent distortion and misalignment.



SECTION 08520 ALUMINUM WINDOWS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum windows. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Windows shall be furnished as a complete assembly including frame, sash, hardware, mullions, and anchorage devices. Windows indicated to have screen or storm units shall be designed to accommodate the items to be furnished. Aluminum extrusions shall be not less than 22,000 psi ultimate tensile strength and not less than 0.062 inch thickness at any location for main frame and sash members. Window sash and frames shall be designed for outside glazing of vision glass. Weather-stripping shall be easily replaceable. All operable sashes shall have a latch or locking devices. Hardware shall be securely attached to the window with non-corrosive bolts or machine screws. Hardware finishes shall match window finishing. Where operating hardware is located 6 feet-6 inches or more above the floor, poles and pole-operated handles shall be provided to operate the windows.

2.2 Aluminum Primed Windows shall be fabricated and assembled in compliance with American Architectural Manufacturers Association AAMA 101 I.S.2.

2.3 Double Glazed Windows shall have a minimum condensation factor in accordance with AAMA 1503.1-98.

2.4 Awning Windows shall conform to AAMA 101 I.S.2, Commercial Grade. Hardware for top ventilators shall be designed to drop sash down in such a manner to permit cleaning of the outside glass from inside the building. All operating hardware except ventilator arms and rotary operators shall be concealed within frame and sill. Ventilator arms shall be concealed when unit is closed.

2.5 Basement Windows shall conform to AAMA 101 I.S.2, Commercial Grade, single project-in at top vent.

2.6 Casement Windows shall conform to AAMA 101 I.S.2, Commercial Grade. Each side hinge ventilator shall have non-friction type extension hinges, under-screen type rotary operator, and locking handles. Rotary operators shall be heavy-duty worm-gear type with machine cut case hardened steel gears.

2.7 Double-Hung and Single-Hung Windows shall conform to AAMA 101 I.S.2, Commercial Grade. Windows shall be provided with a tilt-in sash. Single-hung and double-hung windows shall be provided with locking devices to secure the sash in the closed position. Counterbalancing mechanisms shall be easily replaced after installation.

2.8 Fixed Windows and Semi-Circular Head Windows shall conform to specification AAMA 101 I.S.2, without ventilator sections.

2.9 Horizontal-Sliding Windows shall conform to AAMA 101 I.S.2, Commercial Grade. Windows shall be provided with locking devices to secure the sash in the closed position.

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2.10 Projected Windows shall conform to AAMA 101 I.S.2, Commercial Grade. Where screens are specified, under-screen operators shall be provided for ventilators that open out.

2.11 Top-Hinged Windows shall conform to AAMA 101 I.S.2, Commercial Grade.

2.12 Vertically-Pivoted Windows shall conform to AAMA 101 I.S.2 Commercial Grade. Pivot assemblies shall be designed to allow for removal of ventilator and provide for smooth operation of ventilator. Windows shall be provided with devices to secure the sash in the closed position.

2.13 Storm Windows shall be triple-track, self-storing, combination storm-and-screen type, conforming to AAMA 1002.10. Storm units shall be designed for the type of windows with which they will be used and shall provide a rigid unit in place, to permit all sashes to be removed from the inside and to lock into the open and closed positions. An interlocking scribe piece of the same material as the frame shall be provided at bottom edge. Units shall be complete with all mounting and operating accessories required to provide a weather-tight installation.

2.14 Insect Screens shall be provided for sash or ventilators of designated windows. Insect screens shall be aluminum frames conforming to SMA ANSI/SMA 1004. Aluminum mesh screening shall conform with ISWA IWS 089, or vinyl coated glass screening conforming to ASTM D 3656.

2.15 Forced-Entry Resistant Windows shall be in accordance with the recommendations specified in AAMA 1032.5.

2.16 High Performance Windows shall be in accordance with the requirements of AAMA 101.

2.17 Window Cleaning Anchors shall be of stainless steel and shall conform to ASME A39.1. Windows shall be reinforced for the reception of window cleaning anchors, if necessary to provide the required strength. Window frames shall be reinforced as may be required to receive the window cleaning anchors, and the window frames shall be anchored securely to the wall construction at point of application of the window cleaning bolts.

2.18 Finish: All exposed members shall be free of scratches and other serious surface blemishes. Prime windows shall have anodized finish or paint finish. Anodized finish shall be AA-M12C22A31 clear in accordance with AA Designation System for Aluminum Finishes. Paint finish shall conform to AAMA 603.8. Storm windows shall be mill finish or paint finish, white. Window unit finishes, cleaning, and chemical treatments shall comply with the requirements of NAAMM Metal Finishes Manual and AAMA 603.8.

3.0 EXECUTION: Final adjustment for proper operation of ventilating unit shall be made after glazing. Where aluminum surfaces are in contact with or fastened to dissimilar materials, except stainless steel or zinc, the aluminum surface shall be protected from dissimilar materials as specified in the Appendix of AAMA 101 I.S.2. Surfaces in contact with sealant after installation shall not be coated with any type of protective material. Window shall be cleaned on both interior and exterior surfaces.



SECTION 08610 WOOD WINDOWS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood windows, general. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Awning Replacement Window Units shall comply with NWWDA I.S.2. 2.2 Single Hung Replacement Window Units shall contain one fixed sash and one balanced vertically-sliding sash and shall comply with NWWDA I.S.2.

2.3 Double Hung Replacement Window Units shall contain two balanced vertically-sliding sashes and shall comply with NWWDA I.S.2.

2.4 Horizontal-Sliding Replacement Window Units shall comply with NWWDA I.S.2.

2.5 Fixed Replacement Window Units shall consist of sashes complying with NWWDA I.S.2 and frames complying with NWWDA I.S.1, or NWWDA I.S.2.

2.6 Window, Screen, and Storm Sash Units shall be manufactured from kiln-dried ponderosa pine, Idaho white pine, Northern white pine, or sugar pine.

2.7 Preservative Treatment: All wood parts shall be water repellent preservative-treated in compliance with NWWDA I.S.4.

2.8 Weatherstripping shall be manufacturer's standard nonferrous spring metal or vinyl gasket.

2.9 Insect Screens: Frames shall be manufacturer's standard formed aluminum or extruded aluminum frames. Insect screening shall be either nonferrous metal or plastic-coated fibrous glass insect screen cloth complying with Fed. Spec. L-S-125, Type II.

2.10 Window Operations shall meet or exceed the minimum operating requirements as specified in NWWDA I.S.2. Each window unit shall be supplied with all operating devices required for easy operation and with suitable locks or latches.

2.11 Window Classification (Grade): Window units shall comply with Class A requirements as specified in NWWDA I.S.2.

2.12 Fabrication:

2.12.1 Sizes and profiles shall match existing work and shall be coordinated with actual measurements of window openings.

2.12.2 The Scope of Each Replacement Window Unit, except as otherwise indicated, shall include the sash or sashes, frame, sill (including undersill or nosing, if any), exterior and interior trim, integral mullion and muntins (if any), hardware, and accessories.

2.12.3 Removable Insect Screens shall be provided for each operating sash.

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2.12.4 Glazing Stops (beads) shall be provided, nailed or snap-on, and coordinated with glass selection and glazing system as indicated.

2.13 Finishes:

2.13.1 Painting: Shop prime coat shall comply with Fed. Spec. TT-P-25, color white.

2.13.2 Vinyl Cladding shall be manufacturer's standard bonded vinyl cladding with permanent paintable finish.

2.13.3 Aluminum Cladding shall be manufacturer's standard formed sheet or aluminum cladding with baked-on acrylic coating.

2.14 Woven Glass Cloth shall weigh not less than 2.0 oz./sq. yd. and shall withstand 120 lbs. of pull per square inch. Resin and hardener catalyst shall be as recommended by the manufacturer of the resin.

3.0 EXECUTION: (Section not used.)



SECTION 08710 FINISH HARDWARE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of finish hardware. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Labeled fire doors shall have fire rated hardware, including smoke seals where required by code, in accordance with NFPA 80. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Hardware finishes shall conform to those identified under ANSI/BHMA A156.18. Finish of fasteners shall match finish of hardware items on which they are applied.

2.1 Locks and Latches: To the maximum extent possible, locksets, latchsets, and deadlocks shall be the products of a single manufacturer. Mortise type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Lock fronts for double-acting doors shall be rounded. Mortise locks shall have armored fronts. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes. Trim for mortise locks and latches shall be escutcheon, minimum 7 inches by 1-3/4 inches or sectional, as required, with wrought knob and cast shank and shall conform to the requirements for wrought trim in accordance with ANSI A156.2. Manufacturers' standard plain design shall be used. Keying system shall match remainder of building system (if applicable) or shall be as specified.

2.1.1 Cylinder Locks: Cylinder shall have either six or seven pins with paracentric keyway, as required. Cylinders and the locks in which they are used shall be the product of the same manufacturer. Cylinders shall be provided with removable type single-key cores, where required.

2.1.2 Deadlocks: ANSI A156.5, mortise type, cylinder-operated, E16000 series.

2.1.3 Interconnected Locks and Latches: ANSI A156.12, Grade 1 or 2.

2.1.4 Locksets and Latchsets shall conform to the following types, as required: ANSI A156.2, series 1000, Grade 2; 2000, Grade 1; 4000, Grade 1; A156.13, Operational Grade 1 or 2; and Security Grade 1, 2, 3, or 4.

2.1.5 Locksets for Lead-Shielded Doors shall be provided with factory-installed lead linings. Lead linings shall not be less than the thickness of the lead in the door in which the lockset is required.

2.1.6 Cipher Locks: Cipher locks shall be mechanically operated push button units, with or without master key bypass capability, and changable by authorized access key.

2.1.7 Padlocks: ASTM F 883.

2.2 Door Trim: ANSI A156.6.

2.2.1 Armor Plates shall be category J100, plastic, aluminum, brass, or stainless steel, as required, 40 inches in height, 2 inches less in width than the width of the door for single doors, and 1 inch less for pairs of doors. Edges of metal plates shall be beveled where required. Where the door has a louver panel, the armor plate shall be omitted if top of louver frame is more than 20 inches above the bottom of the door.

2.2.2 Arm Pulls shall be Category J400, double base, aluminum, brass, or stainless steel. **2.2.3 Combination Push-Pull Plates** shall be Category J300, 1/8 inch minimum, aluminum, brass, or stainless steel beveled four edges.

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2.2.4 Drop Ring Pulls shall be Category J400, aluminum, brass, or stainless steel.

2.2.5 Kick Plates shall be Category J100, plastic, aluminum, brass, or stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Height shall be 10 inches, except where the bottom rail is less than 10 inches, the plate shall extend to within ½ inch of the panel mold or glass bead. Edges of metal plates shall be beveled, where required.

2.2.6 Armor Plates and Mop Plates shall be Category J100, plastic, aluminum, brass, or stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. The height of mop plates shall be 4 inches. Edges of metal plates shall be beveled, where required.

2.2.7 Push and Pull Bars shall be Category J500, aluminum, brass or stainless steel, where required. Edges of mounting plates shall be beveled.

2.2.8 Push Plates shall be Category J300, aluminum, brass, stainless steel, or plastic, in color as required, size as required. Edges of metal plates shall be beveled, where required.

2.2.9 Sectional Door Pulls for metal or kalamein doors shall be Category J400 brass, thru-bolted type of plain modern design. Door pulls on plates for wood doors shall be Category J400 aluminum, brass, or stainless steel with beveled edges, as required.

2.3 Exit Devices and Exit Device Accessories: ANSI A156.3.

2.3.1 Door Coordinator shall be Type 21 and shall be provided for each pair of doors with closers and equipped with an overlapping astragal.

2.3.2 Removable Mullions shall be Type 22 of the box type and shall be used only with those exit devices for which the mullions were manufactured. Mullions shall be furnished with mullion stabilizers of the same manufacturer.

2.4 Door Controls: Overhead holders conforming to ANSI A156.8.

2.5 Auxiliary Hardware, including door surface bolts, door holders, door stops, and roller latches, of the types required, shall conform to ANSI A156.16.

2.5.1 Lever Extension Flush Bolts: Type L14081, installed at the top and bottom of the inactive leaf of pairs of doors, and mortised in the lock edge of the door.

2.5.2 Dust-Proof Strikes: Type L04011.

2.5.3 Garment Hooks: Type L03111.

2.5.4 Hand Rail Brackets: Type L03061, L03081, L03091, or L03101.

2.5.5 Garment Rods: Type L03131 or L03141.

2.5.6 Coat Hook: Type L03111.

2.5.7 Door Stop, Adjustable Hinge Type: Type L02223.

2.5.8 Door Stop, Wall Type Flexible, 3 inch: Type L02051, L02052, L02053.



2.5.9 Door Stop, Wall Type Flexible, 4 inch: Type L02061, L02062, L02063.

2.5.10 Door Stop, Floor Mounted, Type L02143.

2.6 Hinges: ANSI A156.1. Hinges used on metal doors and frames shall also conform to ANSI A156.7.

2.6.1 Hinges for Reverse Bevel Doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

2.6.2 Hinges with Anti-Friction Bearings may be furnished in lieu of ball bearing hinges, where required. Fire door hinges shall be in accordance with NFPA 80.

2.7 Door Closing Devices: ANSI A156.4.

2.7.1 Surface Type Closers shall be Series C01000, C02000 Standard Cover, C02000 Full Cover with option PT-4C, or C03000 with options PT-4A and PT-4D, where required. Mounting details for the type closers to be used shall be in accordance with manufacturer's standards. Closers for screen and storm doors shall be Type C09353. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb-mounted. Closers for interior doors close to a wall shall be of narrow projection so as not to strike the wall at the 90 degree open position or shall have parallel arms.

2.7.2 Floor Closers and Pivots shall have cement boxes. Floor closers and pivots used on the same door shall be the product of one manufacturer only. Floor plates are not required where thresholds cover the closer cement box. Setting tools shall be furnished for use in installing floor closers.

2.8 Smoke Detectors and Magnetic Holders: ANSI A156.15. Door closers with integral holders connected to a separate detection device or closers with integral holders and detector units, sensing particles of combustion that when activated will release the holder mechanism causing the closer to close the door may be used in lieu of separate closers, detectors, and magnetic holders. Closers shall be listed or labeled by a nationally recognized independent testing laboratory.

2.9 Key Control Storage System: ANSI A156.5, type and capacity as required, properly labeled for key identification. 08920-2 condition of panels shall be prepared for installation into framing, and either sealed or vented to exterior only. Panels shall be flat, with no deviations exceeding 5 thousands of an inch in 12 inches. Insulated core shall meet the designated k-value.

2.2.3 Brackets and Reinforcements shall be high-strength aluminum units where feasible. Otherwise, nonmagnetic stainless steel shall be used, except at fabricator's option. Brackets not exposed to weather or abrasion may be hot-dipped galvanized steel complying with ASTM A 386. Provide nonstaining, nonferrous shims for installation and alignment of window wall work.

2.2.4 Window Cleaner's Bolts, if required, shall be nonmagnetic stainless steel complying with ASME A39.1.

2.2.5 Concealed Flashing shall be dead-soft stainless steel, 26 gauge.

2.2.6 Fasteners and Accessories shall have exposed portions matching finish of window wall system. At joints where movement must be accommodated, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or similar material recommended by manufacturer.

2.2.7 Inserts for Concrete Masonry shall be cast iron, malleable iron, or hot-dipped galvanized steel complying with ASTM A 386.

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2.2.8 Firestopping Materials shall be mineral fiber insulation or other noncombustible material suitable for permanent placement and complying with applicable regulations.

2.2.9 Finishes shall comply with NAAMM AA-M32C21A31 (0.4 mil) for natural aluminum color and NAAMM AA-M32C21A32 (0.4 mil) for integral color anodized finish.

3.0 EXECUTION: (Section not used.)



SECTION 08810 GLASS AND GLAZING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of glass and glazing materials. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Glazing Compounds and Preformed Glazing Sealants: A suitable type of glazing compound or preformed glazing sealant in compliance with section Glazing Materials of the FGMA Glazing Manual shall be provided.

2.1.1 Gunnable Polymer Glazing Sealants shall be as follows:

2.1.1.1 Acrylic (one-part): ASTM-C-834.

2.1.1.2 Butyl (one-part): ASTM C 1085.

2.1.1.3 Polysulfide (one- or two-part): ASTM C 920.

2.1.1.4 Polyurethane (one- or two-part): ASTM C 920.

2.1.1.5 Silicone (one-part): ASTM C 920 and ASTM C 1184.

2.1.2 Glazing Preformed Tapes shall be butyl or polyisobutylene/butyl and shall be manufacturer's standards.

2.1.3 Knife Grade Glazing Sealants shall be as follows:

2.1.3.1 Wood Sash Putty: CID-A-A-378.

2.1.3.2 Face Glazing Compound: ASTM C 669.

2.1.3.3 Steel Sash Putty: Manufacturer's standard.

2.1.3.4 Channel Glazing Compound: Manufacturer's standard.

2.1.4 Gaskets for Glazing shall be as follows:

2.1.4.1 Dense Neoprene: ASTM C 542 (lock-strip gaskets).

2.1.4.2 Foam Neoprene: ASTM C 509.

2.1.4.3 PVC: ASTM D 2287.

2.1.4.4 Mullion Sections shall be manufacturer's standard for glass size provided.

2.2 Glazing Accessories: Glazing points, chips, shims, angles, beads, setting blocks, spacer strips, and other glazing accessories shall be provided where required to provide a complete installation.

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2.3 Float, Plate or Glass:

2.3.1 Clear Glass: ASTM C 1036, Type I, Class 1, Quality q3.

2.3.2 Heat-Absorbing Glass: ASTM C 1036, Type I, Class 2, Quality q3, Style A.

2.3.3 Light-Reducing Glass: ASTM C 1036, Type I, Class 3, Quality q3.

2.3.4 Greenhouse Glass: ASTM C 1036, Type I, Class 1, Quality q6.

2.4 Tempered Glass: ASTM C 1048, Kind FT, Condition A; Type I, Quality q3 or Type II, Quality q8. All tempered glass shall be purchased to meet field dimensions and shall not be altered in the field.

2.5 Wired Glass: ASTM C 1036, Type II, Class 1, Form 1, Mesh M1, 1/4 inch thick and in compliance with ANSI Z97.1. Wired glass for fire doors and windows shall comply with NFPA 80.

2.6 Figured Glass: ASTM C 1036, Type II, Class 1, Form 3, Quality q8, 1/8 inch thick.

2.7 Rough Glass: Rolled, translucent, flat, glazing quality, one side rough and the other polished, 7/32 inch thick.

2.8 Laminated Glass: Laminated Glass shall be fabricated from two pieces of clear, heat-absorbing, light-reducing, or wired glass, as designated and previously specified, laminated together with a clear vinyl inter-layer. Laminated glass shall comply with ANSI Z97.1.

2.9 Insulating Glass:

2.9.1 Hermetically Sealed Glazing Units shall be fabricated of two lites of glass, separated by a dehydrated air space that is 1/2 inch unless otherwise designated and sealed permanently at the edges. Clear, light-reducing, heat-absorbing, figured, wired, and tempered glass shall be as previously specified.

2.9.2 Manufacturer's Standard Fused-Glass Edge Construction shall use double-strength clear sheet glass and shall only be provided in small applications under 30 sq ft.

2.10 Mirror Glass: Plate or float glass complying with ASTM C 1036, Type I, Class 1, Quality q2, and 1/4 inch thick except as otherwise indicated with a silver coating and protective electrolytic copper coating not less than .0002 inch thick. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint, and shall be backed in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.11 Glazing Plastics:

2.11.1 Cast Acrylic Glazing Plastic Sheets of 1/4 inch thickness, of clear transparent acrylic plastic with a light transmittance of 92 percent for a 1/4-inch sheet, impact resistance to withstand a 16-foot drop of a 1/2-pound steel ball on a 12-inch x 12-inch x 1/4-inch edge-supported sheet, modulus of elasticity of approximately 450,000 psi, flexural strength of 16,000 psi, and 180 F allowable continuous service temperature.

2.11.2 Cast Polycarbonate Glazing Plastic Sheets of 1/4-inch thickness of clear transparent polycarbonate plastic, with a minimum light transmittance of 82 percent for a 1/4-inch sheet and free of significant dimensional change for exterior exposure. Drop ball impact resistance of 200 foot-pounds, for a 12-inch x



12-inch x 1/8-inch edge-supported sheet, modulus of elasticity of 340,000 psi, flexural strength of 13,500 psi, and 250 F allowable continuous service temperature.

2.11.3 Reinforced Polyester Glazing Plastic Sheets of 1/8-inch thickness of clear translucent acrylic-modified polyester plastic sheet with invisible glass fiber reinforcement compounded specifically for exterior exposure with U.V. absorbers with a light transmittance of 92 percent for an 1/8-inch sheet, manufacturer's standard figured or textured surfaces, a modulus of elasticity of 721,000 psi, flexural strength of 17,800 psi, and 180 F allowable continuous service temperature.

2.11.4 Reinforced Polyvinyl Chloride Sheets of 0.12 inch thickness of clear transparent rigid polyvinyl chloride with .011-inch galvanized steel mesh woven to 10 mesh screening and located in the center of the sheet thickness. The sheet shall have a light transmission of 85 percent for a 1/4-inch sheet, tensile strength of 8,500 psi, flexural modulus of 550,000 psi, and flexural strength of 15,000 psi.

2.12 Bullet-Resisting Glass: Glass shall be fabricated from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass. The thickness of each layers of glass shall be in accordance with the manufacturer's standard practice. The total nominal thickness of the laminated glass shall be 1-3/16 inches. Glass shall meet the test requirements of the Underwriters' Laboratory for bullet-resisting materials. Listing in Underwriters' Laboratory Guide COGT will be accepted as evidence of compliance with this requirement in lieu of a certificate.

2.13 One-Way Vision Glass: Glass shall be fabricated from Type I, Class 1, Quality q2, 1/4-inch thick glass. One face shall be coated with a hard adherent film of chromium or other approved coating of proven equivalent durability. The glass shall transmit not less than 5 percent or more than 11 percent of total incident light in the visible region and shall reflect from the front surface of the coating not less than 45 percent of the total incident light in the visible region.

2.14 Spandrel Glass: ASTM C 1048, Kind HS, Condition B, Type I, Quality q5.

2.15 Reflective Glass: ASTM C 1048, Kind HS or FT, Condition C, Type I, Quality q3, with minimum 10 percent visible light transmission and maximum 25 percent solar energy transmittance.

3.0 EXECUTION:

3.1 Preparation: Preparation of glazing and surrounding area shall comply with the details and general conditions governing glazing in the FGMA Glazing Manual unless otherwise specified.

3.1.1 Glazing: Remove broken glazing and putty from frames.

3.1.2 Frames: Clean existing frames. Replace missing or inoperative gaskets and glazing beads.

3.2 Installation:

3.2.1 General: The Contractor shall determine glazing dimensions by measuring the actual opening to receive the glass. Install sheet glass with the visible lines or waves running with the horizontal dimensions. Leave labels in place until the installation is approved.

3.2.2 Glass Setting: Items shall be glazed using glass of the quality and thickness specified or indicated. Doors and windows may be glazed in compliance with one of the glazing methods described in the standards under which they are produced, except the face puttying method will not be permitted.

3.2.3 Wired Glass: Install wire glass for fire doors and fire windows in compliance with the requirements of NFPA 80.

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3.2.4 Cleaning: Glass surfaces shall be thoroughly cleaned, with labels, paint spots, putty, and other defacements removed and shall be clean at the time the work is accepted.



SECTION 08915 ALUMINUM WINDOW WALLS/CURTAIN WALLS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum window walls. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 System Performance:

2.1.1 Load-Bearing Strength (wind resistance) shall be designed according to American Society of Civil Engineers' ASCE 7 - 6.4.2, "Analytical Procedure" tested in accordance with ASTM E 330, ANSI A58.1, and AAMA CW 1-9.

2.1.2 Deflections and Thermal Movements shall be as recommended by the wall manufacturer for the project site.

2.1.3 Leakage Resistance: Air leakage shall be in accordance with ASTM E 283. Water penetration shall be in accordance with ASTM E 331.

2.1.4 Condensation Resistance Factor (CFR) shall be not less than 55 when tested in compliance with AAMA 1503.1.

2.1.5 Sound Transmission Classification (STC) shall be as designated by the Contracting Officer, not less than 34 decibels(db), and in accordance with ASTM E 90.

2.1.6 The wall system shall comply in general with applicable provisions of the AAMA Metal Curtain Wall, Window, Store Front, and Entrance Guide Specifications Manual (GSM-1).

2.2 System Components:

2.2.1 Aluminum Members (extrusions, formed members, sheet, and plate) shall be in compliance with requirements of:

ASTM B 221 for extruded bars, rods, shapes and tubes

ASTM B 209 (209M) for sheet/plate.

ASTM B 429 for extruded structural pipes and tubes

2.2.2 Insulated Panels shall be laminated aluminum-faced panels finished to match window wall framing. Face sheets shall be not less than 0.0249 inch thick. Concealed back sheets shall be of aluminum or galvanized steel. Edge condition of panels shall be prepared for installation into framing, and either sealed or vented to exterior only. Panels shall be flat, with no deviations exceeding 5 thousands of an inch in 12 inches. Insulated core shall meet the designated k-value.

2.2.3 Brackets and Reinforcements shall be high-strength aluminum units where feasible. Otherwise, nonmagnetic stainless steel shall be used, except at fabricator's option. Brackets not exposed to weather or

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abrasion may be hot-dipped galvanized steel complying with ASTM A 386. Provide non-staining, nonferrous shims for installation and alignment of window wall work.

2.2.4 Window Cleaner's Bolts, if required, shall be nonmagnetic stainless steel complying with ASME A39.1.

2.2.5 Concealed Flashing shall be dead-soft stainless steel, 26 gauge complying with ASTM A666 compatible with system.

2.2.6 Fasteners and Accessories shall have exposed portions matching finish of window wall system. At joints where movement must be accommodated, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or similar material recommended by manufacturer.

2.2.7 Inserts for Concrete Masonry shall be cast iron, malleable iron, or hot-dipped galvanized steel complying with ASTM A 386.

2.2.8 Firestopping Materials shall be mineral fiber insulation or other noncombustible material suitable for permanent placement and complying with applicable regulations.

2.2.9 Finishes shall comply with NAAMM AA-M32C21A31 (0.4 mil) for natural aluminum color and NAAMM AA-M32C21A32 (0.4 mil) for integral color anodized finish.

3.0 EXECUTION: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Fit joints to produce hairline joints. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system. Install system plumb, level and in alignment with established lines and grades. Conduct air infiltration and water penetration tests. Repair or replace areas damaged during testing. Protect finished installation against damage until substantial completion.



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DIVISION 09 FINISHES



SECTION 09941 PAINTING OF WATER STORAGE TANK INTERIOR SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank interior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Mil. Spec. DOD-P-15328, SSPC Paint 8, and Mil. Spec. MIL-P-15930.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.1.2 Forced Ventilation: Whenever surface preparation or painting operations include the use of volatile organic solvents, the enclosed space shall be made safe at all times from fire and explosion as determined by a calibrated explosimeter or organic vapor analyzer. During the painting operation, sufficient exhaust ventilation shall be provided to exchange the air in the enclosed spaces with fresh air at the rate of 5,000 cfm for each spray gun in operation. All parts of the enclosed spaces shall be swept by moving air. Exhaust ducts shall discharge clear of working areas and away from sources of possible ignition. If the ventilation fails, operations shall be stopped and the compartment evacuated until sufficient exhaust ventilation is provided.

3.1.3 Blast Cleaning: Ferrous surfaces shall be dry blast cleaned to near white metal grade, which shall be in compliance with SSPC-SP 5, except that paragraphs 3.1, 3.2, 3.3, and 3.10 shall not be applicable and except that a limited relaxation from the uniform white metal grade of surface cleanliness will be permitted, as follows. The metal shall be cleaned to such a degree that were a large surface to be divided into 6-inch squares, at least 75 percent of the subdivisions would meet the white metal grade of cleanliness and the remaining subdivisions would be randomly distributed. Within these small, randomly distributed areas a minor relaxation from white metal cleanliness would be permitted, consisting only of very slight shadows, stains, and discolorations stemming from very thin, adherent, sparsely scattered residues of mill scale and corrosion products. No relaxation from the white metal grade will be permitted on surface irregularities such as edges, interior angles, welds, rivet lines, and junctions of joining members. The overall blasting effort expended shall be not less than two-thirds (2/3) of that which would be required to accomplish the white metal grade of cleanliness on the specific surfaces involved, but this limitation shall not be construed as a waiver of any of the requirements above. Remove weld spatter not dislodged by blasting with impact or grinding tools. Surfaces shall be dry at the time of blasting.

3.1.4 Surface Protection: Within 8 hours after cleaning but in any event prior to the deposition or formation of any detectable moisture, contaminants, or corrosion, all ferrous surfaces that have been blast cleaned to the near-white metal grade shall be cleaned of dust and abrasive particles by brushing, vacuum cleaning, and/or blowdown with clean, dry compressed air, and shall be given the pretreatment and first coat of paint.

3.1.5 Pretreatment: All sandblasted surfaces shall receive a washcoat pretreatment complying with Mil. Spec. DOD-P-15328. Application shall be by spray, and all requirements of the specification concerning mixing, thinning, application, and spreading rate shall be followed. All materials not applied within a maximum of eight hours after mixing shall be discarded and must not be used.

3.2 Installation:

3.2.1 Primer Paint: All pretreated surfaces shall receive two coats of vinyl paint complying with Mil. Spec. MIL-P-15930. Application shall be by brush or spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding primer coat (or initial



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finish coat) shall not be applied until the primer is dry to touch. The color of alternate coats shall provide contrast to assist in obtaining complete coverage.

3.2.2 Finish Paint: All primed surfaces shall receive a minimum of two coats of Aluminum Vinyl Finish Paint complying with SSPC Paint 8. The paint shall be formulated as specified except that high boiling solvents such as cyclohexanone shall not be used in the formulation. High boiling solvents may be substituted for the ketones specified in the thinner only if ambient temperatures at the time of application exceed 75 F (24 C). Application shall be by spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding coat shall not be applied until the first coat is dry to touch.

3.2.3 Thickness Requirements: Apply the washcoat pretreatment to a dry film thickness of at least 0.3 mils but not exceeding 0.5 mils. Apply the primer paint to produce a dry film of approximately 2.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement at no additional cost to the Government. Final thickness measurements shall be made by the Contractor in the presence of the Contracting Officer using a magnetic thickness gauge as specified in SSPC-PA 2.

3.2.4 Final Drying Time: After the final coat of paint has been applied, the tank shall remain open and forced ventilation shall be continued for a minimum of three days prior to being flooded with water. 3.2.5 Washing: After the final work has been completed in the tank, but prior to any disinfecting operations, wash the tank with clean water to remove all dust and overspray. Washing may take place during the final dry time provided the coating is sufficiently cured to withstand the abuse.

3.2.6 Disinfection of Tank: After painting and all other interior work has been completed, disinfect the tank before it is replaced in service. If the local medical facility or health department requires a specific procedure for disinfection, follow that procedure. Otherwise the following procedure shall be followed: Place water containing 50 ppm chlorine in the tank to such a depth that when the tank is filled the resultant chlorine concentration shall be no less than 2 ppm. Hold the water containing 50 ppm chlorine in the tank for 24 hours before the tank is filled. Allow the full tank, in turn, to stand for 24 hours, after which the tank may be put into service without draining the water used to disinfect it.

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SECTION 09210 PLASTER REPAIRS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plaster for repairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Materials shall comply with ASTM C 841 and C 842 unless otherwise specified.

2.2 Finish Plaster shall be gypsum plaster or Keene's cement.

2.3 Lath and Furring shall be wood, gypsum, or metal to match existing. Paper backing shall be used on metal lath except when applied over masonry or concrete. Lath for Portland cement plaster shall comply with ASTM C 1063.

2.4 Portland Cement: ASTM C 150, Type I or Type II. Only one type and brand shall be used in the work.

2.5 Portland Cement Plaster: CSI 09220.

2.6 Metal Trim: New metal trim required for replacement of damaged or deteriorated trim shall be compatible with the existing metal trim.

2.7 Gypsum Wallboard for repair of solid but severely cracked plaster shall be 1/4 inch thick, 4-foot by 8-foot sheets.

2.8 Color: FED. STD. 595.

3.0 EXECUTION:

3.1 Preparation: Appropriate measures shall be taken to contain dust and protect adjacent surfaces during removal and replacement. Damaged or deteriorated plaster and accessories shall be removed and disposed of as required. Surfaces to which old plaster was applied shall be cleaned of all loose or foreign materials which might inhibit bonding or proper fitting of new plaster, lathing, and accessories. Concrete or masonry surfaces to be replastered shall be coated with a continuous film of bonding agent.

3.2 Environmental Conditions: A temperature of not less than 55 F shall be maintained in the building for 24 hours before, during, and after plaster application.

3.3 Plaster Installation: Plaster shall be installed in compliance with ASTM C 842. Portland cement plaster shall be installed for all exterior surfaces and all interior surfaces subject to high humidity. Gypsum plaster shall be installed for all remaining interior surfaces. Color, texture, finish, and thickness of plaster shall match adjacent, undamaged plaster or designated areas.

3.3.1 Plaster over Existing Work: Where replacement of the top or finish coat only is required, only the damaged or deteriorated finish coat shall be removed. New finish coat shall be applied, allowed to dry, and sanded to bring smooth with existing adjacent surfaces.



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3.3.2 Ornamental Plaster: New plaster shall be run full, straight, and true with molding plaster using clean cut metal conforming to the existing profiles. Rough spots shall be sanded and left ready for painting.

3.3.3 Restoration: The Contractor shall replace or reinstall to the original condition all materials removed to get to the repair work. Materials damaged during removal or reinstallation shall be replaced with similar new materials.



SECTION 09260 GYPSUM DRYWALL AND METAL STUDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum drywall. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 Gypsum Panel - Sheetrock fire code gypsum panels (single layer).

2.2 Fasteners - Self-tapping steel screws with rust inhibited coating.

2.3 Insulation - 11/2- inch termafiber sound attenuating blankets or as circumstance dictates.

2.4 Metal Accessories - Corner Beads, trim, etc. shall be galvanized steel.

2.5 Joint Treatment - As recommended by manufacturer.

2.6 Perimeter Caulking - Acoustical as recommended by manufacturer.

2.7 Control Joints - Zinc.

2.8 Joint compound shall be asbestos free type.

2.9 Acoustical Sealant -As recommended by Manufacturer.

2.10 Metal Studs

2.10.1 Steel studs shall be hollow type spaced 16-inches on centers of sizes indicated, built up with diagonal wire web of No. 7 gauge cold drawn wire, diagonally spaced and welded at 8-inch intervals between outer chords on 1/2-inch x 1/2-inch angles, No. 16-gauge cold rolled steel.

2.10.2 Place steel studs approx. 2-inches from abutting partitions and 2-inches from each side of interior angle of all corners.

2.10.3 Steel studs shall be secured to top tracks with 22-ga. galvanized steel adjustable stud shoes.

2.11 STUD TRACKS

2.11.1 Floor and ceiling stud tracks shall be 22-ga. cold rolled steel with 1/2-inch legs and securely fastened to beams, slabs or partitions with 1/2-inch stud bolts or other method approved by manufacturer spaced not more than 24 inches on centers.



2.11.2 In locations where drawings indicate partitions on an existing floor (wood, asphalt tile, etc.), remove existing floor to allow partition to be secured to a sound concrete sub-surface.

2.12 STUD SHOES

2.12.1 Stud shoes shall be wire tied to studs with two double strands of 18-ga. galvanized tie wire.

2.13 HORIZONTAL BRACING

2.13.1 Shall consist of 3/4-inch steel furring channels fastened to inside of stud with webs in a horizontal position. Spacing of channels shall not exceed 6 feet.

3.0 EXECUTION:

3.1 Gypsum ceiling panels screw attached to metal furring channels clipped or wire tied to suspended main runner channels or wire tied to main support members.

3.2 Provide control joints where ceiling abuts dissimilar wall or ceiling or a structural element.

3.3 Gypsum wall panels shall be screwed to metal studs or furring channels and to and bottom metal track.

3.4 All joints of ceiling or wall panels shall be taped with at least two coats of joint compound. See manufacturers instructions for applicable installation.

3.5 Align stud track accurately to the partition layout @ Both floor and Ceiling.

3.6 Adjust all members for straight and proper alignment.



Section 09310 Ceramic Tile

PART

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1A (1992) Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar

ANSI A108.1B (1992) Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar

ANSI A108.4 (1992) Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive

ANSI A108.5 (1992) Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar

ANSI A108.10 (1992) Installation of Grout in Tilework

ANSI A108.11 (1992) Interior Installation of Cementitious Backer Units

ANSI A118.1 (1992) Dry-Set Portland Cement Mortar

ANSI A118.4 (1992) Latex-Portland Cement Mortar

ANSI A118.6 (1992) Ceramic Tile Grouts

ANSI A118.9 (1992) Test Methods and Specifications for Cementitious Backer Units

ANSI A136.1 (1992) Organic Adhesives for Installation of Ceramic Tile

ANSI A137.1 (1988) Ceramic Tile

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185 (1994) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

ASTM C 33 (1993) Concrete Aggregates

ASTM C 144 (1993) Aggregate for Masonry Mortar

ASTM C 150 (1995) Portland Cement

ASTM C 206 (1984; R 1992) Finishing Hydrated Lime



ASTM C 207	(1991; R 1992) Hydrated Lime for Masonry Purposes
ASTM C 241	(1990) Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 648	(1984; R 1989) Breaking Strength of Ceramic Tile
ASTM C 847	(1988; R 1992) Metal Lath

MARBLE INSTITUTE OF AMERICA (MIA)

MIA-01 (1991) Design Manual IV Dimensional Stone

TILE COUNCIL OF AMERICA (TCA)

TCA-01 (1994) Handbook for Ceramic Tile Installation

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Tile; FIO

Setting-Bed; FIO

Mortar, Grout, and Adhesive; FIO

Manufacturer's catalog data.

SD-06 Instructions

Tile; FIO

Mortar and Grout; FIO

Manufacturers preprinted installation and cleaning instructions.

SD-13 Certificates

Tile; FIO

Mortar, Grout, and Adhesive; FIO

Certificates indicating conformance with specified requirements. A master grade certificate shall be furnished for tile.

SD-14 Samples

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Tile; GA

Marble Thresholds; GA

Samples of sufficient size to show color range, pattern, type and joints.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover.

1.4 ENVIRONMENTAL REQUIREMENTS

Ceramic tile work shall not be performed unless the substrate and ambient temperature is at least 10 degrees C (50 degrees F) and rising. Temperature shall be maintained above 10 degrees C (50 degrees F) while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used they shall be vented to the outside to avoid carbon dioxide damage to new tile work.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

PART 2 PRODUCTS

2.1 TILE

Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate. Tile shall be impact resistant with a minimum breaking strength for wall tile of 41 kg (90 lbs) and 113 kg (250 lbs) for floor tile in accordance with ASTM C 648. Tile for cold climate projects shall be rated frost resistant by the manufacturer as determined by ASTM C 1026. Water absorption shall be 0.5 maximum percent in accordance with ASTM C 373. Floor tile shall have a minimum static coefficient of friction of 0.5 in accordance with ASTM C 1028. Tile shall be Class III as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic.

2.1.1 Mosaic Tile

Ceramic mosaic tile and trim shall be unglazed porcelain ceramic mosaics. Tile size shall be 50mm x 50mm (2" x 2") in size. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

2.1.2 Quarry Tile

Quarry tile and trim shall be unglazed with smooth surface. Tile shall be 200mm x 200mm (8" x 8"). Color shall be in accordance with Section 09915 COLOR SCHEDULE.

2.1.3 Wall Tile



Wall tile and trim shall be cushion edged with either bright or matte glaze. Wall tile shall be 50mm x 50mm (2" x 2") or 100mm x 100mm (4" x 4"); refer to color, size and manufacturer information in Section 09915 COLOR SCHEDULE.

2.2 SETTING-BED

The setting-bed shall be composed of the following:

2.2.1 Aggregate for Concrete Fill

Aggregate shall conform to ASTM C 33. Maximum size of coarse aggregate shall not be greater than one-half the thickness of concrete fill.

2.2.2 Portland Cement

Cement shall conform to ASTM C 150, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Sand shall conform to ASTM C 144.

2.2.4 Hydrated Lime

Hydrated lime shall conform to ASTM C 206, Type S or ASTM C 207, Type S.

2.2.5 Metal Lath

Metal lath shall be flat expanded type conforming to ASTM C 847, and weighing not less than 1.4 kg/square meter (2.5 pounds per square yard).

2.2.6 Reinforcing Wire Fabric

Wire fabric shall conform to ASTM A 185. Wire shall be either 50 by 50 mm mesh, 16/16 wire or 38 by 50 mm mesh, 16/13 wire.

2.3 WATER

Water shall be potable.

2.4 MORTAR, GROUT, AND ADHESIVE

Mortar, grout, and adhesive shall conform to the following:

2.4.1 Dry-Set Portland Cement Mortar

ANSI A118.1.

2.4.2 Latex-Portland Cement Mortar

ANSI A118.4.

2.4.3 Ceramic Tile Grout

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ANSI A118.6; sand portland cement grout, dry-set grout, latex-portland cement grout, commercial portland cement grout or silicone rubber grout.

2.4.4 Organic Adhesive

ANSI A136.1, Type I.

2.4.5 Cementitious Backer Board

Cementitious backer units shall comply with ANSI A118.9.

2.5 MARBLE THRESHOLDS

Marble thresholds shall be of size required by drawings or conditions. Marble shall be Group A as classified by the MIA-01. Marble shall have a fine-sand-rubbed finish and shall be white or gray in color as approved by the Contracting Officer. Marble abrasion shall be not less than 12.0 when tested in accordance with ASTM C 241.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1A or ANSI A108.1B for surface conditions for the type setting bed specified and for workmanship. Variations of surface to be tiled shall fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	3 mm in 2.4 meter	3.0 mm in 3 meter
Organic Adhesives	3 mm in 2.4 meter	1.5 mm in 1 meter
Latex portland cement mortar	3 mm in 2.4 meter	3.0 mm in 3 meter

3.2 GENERAL INSTALLATION REQUIREMENTS

Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Floor tile installation shall not be started in spaces requiring wall tile until after wall tile has been installed. Tile in colors and patterns indicated shall be applied in the area shown on the drawings. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases and coves shall be solidly backed with mortar.

3.3 INSTALLATION OF WALL TILE

Wall tile shall be installed in accordance with the TCA-01, method W242 or W243 for dry areas and W244 and B412 for wet areas around bathtubs.

3.3.1 Dry-Set Mortar and Latex-Portland Cement Mortar



Dry-set or Latex-portland cement shall be used to install tile in accordance with ANSI A108.5. Latex portland cement shall be used when installing porcelain ceramic tile.

3.3.2 Organic Adhesive

Organic adhesive installation of ceramic tile shall conform to ANSI A108.4.

3.4 INSTALLATION OF FLOOR TILE

Floor tile shall be installed in accordance with TCA-01, methods F121 for mortar bed and F122 for thin set.

3.4.1 Workable or Cured Mortar Bed

Floor tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor. Workable mortar bed materials and installation shall conform to ANSI A108.1A. Cured mortar bed and materials shall conform to ANSI A108.1B. Joints between quarry tile shall be between 6.35 mm (1/4 inch) and 9.53 mm (3/8 inch) in width and shall be uniform in width.

3.4.2 Latex-Portland Cement

Latex-portland cement mortar shall be used to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.5. Latex portland cement shall be used when installing porcelain ceramic tile.

3.4.3 Ceramic Tile Grout

Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.10.

3.4.4 Concrete Fill

Concrete fill shall be composed by volume of 1 part portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mixed with water to as dry a consistency as practicable. The fill shall be spread, tamped, and screeded to a true plane, and pitched to drains or leveled as shown. Concrete fill shall be thoroughly damp-cured before application of setting-bed material thereon. Concrete fill shall be reinforced with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped not less than 50 mm. Laps shall be tied together with 1.3 mm (18 gauge) wire every 250 mm along the finished edges and every 150 mm along the cut ends and edges. The reinforcement shall be supported and secured in the centers of concrete fills. The mesh shall be continuous; except where expansion joints occur, mesh shall be cut and discontinued across such joints. Reinforced concrete fill shall be provided under the setting-bed where the distance between the under-floor surface and the finished tile floor surface is 50 mm or greater, and shall be of such thickness that the mortar setting-bed to be placed over the concrete fill shall be not less than 19 mm nor more than 31 mm thick at any point.

3.4.4 Cementitious Backer Board

Cementitious backer units shall be installed in accordance with ANSI A108.11. Fasteners shall be type designed for cement board application.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Thresholds shall be installed where indicated in a manner similar to that of the ceramic tile floor. Thresholds shall be the full width of the opening. Head joints at ends shall not exceed 6 mm in width and shall be grouted full as specified for ceramic tile.

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3.6 CONTROL JOINTS

Joints shall be formed as indicated and sealed as specified in Section 07920 JOINT SEALING.

3.6.1 Walls

Control joints shall be provided at control joints in backing material. Wherever backing material changes, a control joint shall be formed to separate the different materials.

3.6.2 Floors

Control joints shall be provided over construction joints, control joints, and expansion joints in concrete slabs. Control joints shall also be provided where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 7.2 to 10.8 m each way in large interior floor areas and 3.6 to 4.8 m each way in large exterior areas or areas exposed to direct sunlight or moisture. Expansion joints shall extend through setting-beds and fill.

3.7 CLEANING AND PROTECTING

Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

--END OF SECTION--



Section 09315 Tile Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic tile flooring, ceramic mosaic tile flooring, conductive ceramic tile flooring, quarry tile flooring, slate flooring, and quarry tile by the acid-resistant installation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Glazed Ceramic Tile: ANSI A137.1.

2.2 Ceramic Mosaic Tile: ANSI A137.1.

2.2.1 Natural Clay Tile.

2.2.2 Porcelain Body Tile.

2.2.3 Slip-Resistant Tile: ANSI A137.1.

2.2.4 PregROUTED Sheets of ceramic tile, factory-assembled and grouted with manufacturer's standard polyurethane material.

2.3 Conductive Ceramic Tile: Complying with Type I, Class F.

2.4 Quarry Tile: ANSI A137.1. Wax-coated top surface for acid-resistant installation.

2.4.1 Slip-Resistant Quarry Tile shall comply with TCA ANSI A137.1, Section 5.2.1.2.9.

2.5 Slate: Grade A, unfading slate flooring.

2.6 Base Units: Cove type, round top.

2.7 Trim Pieces: For base shall be cove or bullnose.

2.8 Mortar and Grout Materials:

2.8.1 Portland Cement: ASTM C 150, Type 1.

2.8.2 Aggregate: Sand, ASTM C 144.

2.8.3 Dry-Set Mortar and Grout: ANSI A118.1, TCA Formula 759 or 763 (as applicable).

2.8.4 Conductive Dry-Set Mortar: Conforming to ANSI A118.2.

2.8.5 Conductive Latex Mortar: Conforming to ANSI A118.2.

2.8.6 Liquid Latex: ANSI A118.4 except latex shall be non-remulsifiable in water.

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2.8.7 Epoxy Mortar and Grout: TCA Formula AAR-II, two-component epoxy resin, hardener, and mineral filler complying with ANSI A118.3.

2.8.8 Furan Mortar.

2.8.9 Furan Grout.

2.8.10 Water shall be clean, fresh, potable water approved by Public Health authorities for domestic consumption.

2.8.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives, factory-blended to decrease shrinkage.

2.9 Adhesives:

2.9.1 Epoxy Adhesive: TCA Formula C150, two component epoxy resin and hardener.

2.9.2 Organic Adhesive: ANSI A136.1 with TCA certification of conformance.

2.10 Sealants:

2.10.1 Polysulphide: ASTM C 920, Type S, Grade P, synthetic-rubber base.

2.10.2 Polyurethane: ASTM C 920, Type S, Grade P.

2.10.3 Silicone: ASTM C 920, Type S, able to withstand an increase and decrease of at least 50 % of the joint width as measured at the time of application, and ASTM C 1184.

2.11 Adhesive and Joint Sealant: ASTM C 920, Grade NS, Class 25.

2.12 Cleavage Membrane: One of the following:

2.12.1 Saturated Felt: ASTM D 250, 15-pound type.

2.12.2 Polyethylene Film: ASTM D 2103, Type O, 0.004 inch thick.

2.13 Marble Thresholds: Group A per Marble Institute of America MIA-01, with rounded edges and sand rubbed finish.

2.14 Reinforcing Mesh: ASTM A 185.

2.15 Plywood: DOC PS 1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted.

2.16 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.

2.17 Backer Rod: Closed cell polymeric foam, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623 and water absorption less than 0.02 gms/cc per ASTM C 1083.

2.18 Elastomeric Sheet: 40 mil complying with ASTM D 2103.

3.0 EXECUTION:



3.1 General: Comply with ANSI A108.1 through A108.7 except as otherwise indicated and with TCA Handbook for Ceramic Tile Installation.

3.2 Portland Cement Mortar Bed: Install in accordance with ANSI A108.1, as modified herein.

3.2.1 Mix Mortar in proportion on one part Portland cement to five parts dry sand or six parts damp sand.

3.2.2 On Wood and Framed Concrete Slab Floors provide a cleavage membrane before placing setting bed, with edges of sheets lapped.

3.2.3 On Cleavage Membrane lay welded wire mesh reinforcing, lapping three inches at all edges.

3.2.4 Install Mortar and tamp heavily to compact bed to depth of 3/4 inch to 1-1/4 inches.

3.3 Dry-Set Portland Cement Mortar Bed: Install in accordance with ANSI A108.5 except as modified below.

3.3.1 Carefully Work Sufficient Water into dry-set mortar to obtain desired consistency.

3.3.2 Mix Mortar Ingredients thoroughly before adding latex. Carefully work in sufficient latex to obtain desired consistency.

3.3.3 Rework Mixes from time to time to maintain proper consistency, but do not add additional ingredients.

3.3.4 Apply Layer of Mortar to form a thickness of at least 1/8 inch.

3.4 Organic Adhesive Application: Install in accordance with ANSI A108.4.

3.5 Install Conductive Ceramic Tile in accordance with ANSI A108.7.

3.5.1 Testing: Conductive ceramic tile floors shall be tested in accordance with NFPA 99.

3.5.2 Replacement: Floors that have not met requirements of NFPA 56 within six months after they are installed shall be removed and replaced with properly conductive floor by this Contractor at no additional cost to the Government.

3.6 Install Quarry Tile and Slate in accordance with ANSI A108.3.

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SECTION 09320 CERAMIC WALL TILE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic wall tile. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Tile:

2.1.1 Ceramic Tile: Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade-sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate.

2.1.2 Ceramic Mosaic Tile and Trim shall be unglazed natural clay or porcelain with cushion edges. Tile size shall be 1 inch by 1 inch, 1 inch by 2 inches, 2 inches by 2 inches, or a mixture of standard sizes in a stock pattern, as selected.

2.1.3 Glazed Wall Tile and Trim shall be cushion-edged with bright or matte glaze. Tile shall be 4-1/4 inches by 4-1/4 inches, 4-1/4 inches by 6 inches, or 6 inches by 6 inches and, as selected.

2.1.4 Accessories: Accessories shall be the built-in type of the same materials and finish as the wall tile.

2.2 Setting Bed: Metal lath shall be flat expanded type conforming to ANSI A42.3 or A42.4, and weighing not less than 2.5 pounds per square yard.

2.3 Water shall be potable.

2.4 Mortar, Grout, and Adhesive shall conform to the following:

2.4.1 Dry-Set Portland Cement Mortar: ANSI A118.1.

2.4.2 Organic Adhesive: ANSI A136.1, Type I.

2.4.3 Epoxy Resin Grout: ANSI A118.3.

2.4.4 Furan Resin Grout: ASTM C 395.

3.0 EXECUTION:

3.1 Preparation: Surface to receive tile shall conform to the requirements ANSI A108.1 for surface conditions for the type setting bed required and for workmanship.

3.2 Installation:

3.2.1 General: Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation.

3.2.2 Installation of Wall Tile:



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3.2.2.1 Plastic or Cured Mortar Bed: Tile shall be installed over a plastic mortar bed or a cured mortar bed. A 4-mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Plastic mortar bed, materials, and installation of tile shall conform to ANSI A108.1. Cured mortar bed and materials shall conform to ANSI A108.1. Dry-set mortar method of installing tile over a cured mortar bed shall conform to ANSI A108.5.

3.2.2.2 Dry-Set Mortar: Dry-set mortar shall be used to install tile directly over clean, sound, dimensionally stable masonry in accordance with ANSI A108.5.

3.2.2.3 Organic Adhesive: Organic adhesive installation of ceramic tile shall conform to ANSI A108.4.

3.3 Cleaning: Upon completion, tile surfaces shall be thoroughly cleaned in accordance with ANSI A108.1. Acid shall not be used for cleaning glazed tile.

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Section 09405 Terrazzo

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for terrazzo floors and stairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Terrazzo Materials and Installation shall comply with specifications and recommendations of The National Terrazzo and Mosaic Association, Inc. (NTMA)

2.2 Underbed Reinforcement shall be 2-inch by 2-inch by 16-gauge welded wire mesh, ASTM A 185, galvanized.

2.3 Isolation Membrane shall be polyethylene film, complying with ASTM D 2103, not less than 4.0 mils thick.

2.4 Cast-In-Place Terrazzo Materials:

2.4.1 Portland Cement shall conform to ASTM C 150, Type I, except as modified to comply with NTMA requirements for compressive strength. Provide non-staining white cement for terrazzo matrix. Provide standard gray cement for underbed.

2.4.2 Sand shall conform to ASTM C 33.

2.4.3 Aggregate shall be natural, sound, crushed marble chips without excessive flats or flakes, complying with NTMA requirements.

2.4.4 Monolithic Terrazzo shall be 1/2-inch total thickness over concrete slab.

2.4.5 Bonded Terrazzo shall be 1/2-inch terrazzo over a 1-1/4 inch minimum underbed.

2.5 Thinset Epoxy and Polyester Materials:

2.5.1 Polyacrylate-Modified Cementitious Terrazzo Matrix: Polyacrylate and color pigment complying with NTMA "Guide Specification for Polyacrylate Modified Terrazzo."

2.5.2 Polyester Resin Terrazzo Matrix: Two-component polyester resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Polyester Terrazzo."

2.5.4 Epoxy Resin Terrazzo Matrix: Thermosetting, amine-cured epoxy resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Epoxy Terrazzo."

2.5.5 Conductive Terrazzo with Resinous Matrix: Electricity conductance shall conform to resistance levels established by the UL 779.

2.6 Precast Terrazzo: Precast terrazzo base and stair units shall comply with NTMA.

2.7 Sealer: Colorless, slip-and stain-resistant, non-yellowing penetrating sealer that will not disturb color or physical properties of terrazzo surface; pH factor between 7 and 10.



2.8 Plywood: DOC PS 1, "C-C EXT-APA" or "Underlayment C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted.

2.9 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.

2.10 Elastomeric Sheet: 40 mil thick extruded, homogeneous, waterproof, impervious, nonplasticized chlorinated polyethylene sheet, complying with ASTM D 2103.

2.11 Curing Materials:

2.11.1 Polyethylene Film: Non-staining type.

2.11.2 Paper: Non-staining, heavy building paper.

2.11.3 Curing Compound: Liquid membrane-forming compound, complying with ASTM C 309, Type I.

2.12 Cleaner: Neutral liquid chemical cleaner, biodegradable, free from crystalline salts, phosphate or water soluble alkaline salts, formulated for terrazzo, pH factor between 7 and 10.

3.0 EXECUTION:

3.1 Preparation: Clean and prepare substrate to comply with NTMA specifications for type of terrazzo application indicated. Clean area to receive terrazzo of loose chips and all foreign matter. Grind concrete substrate as required to provide surfaces within tolerances required by NTMA.

3.2 Installation:

3.2.1 Comply with NTMA and manufacturer's recommendations for proportioning mixes, for installation of strips, and for placing, curing, grinding, grouting, and finishing.

3.2.2 Provide terrazzo bases, thresholds, stair treads, and landings as required.

3.2.3 Install Divider and Accessory Strips in an adhesive setting bed, without voids below strips. Provide mechanical anchorage for adequate attachment of strips to substrate.

3.2.4 Provide Control Joints by installing angle type divider strips back-to-back with neoprene rubber filler cemented between strips, flush with finish floor.

3.2.5 Provide for Expansion Joints by installing angle type divider strips back-to-back, with removable filler of the width shown (but not less than 1/4 inch wide) between strips.

3.2.6 Install Abrasive Inserts where required.



SECTION 09510 ACOUSTICAL CEILINGS

PART

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 635 (1994) Manufacture performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings

ASTM C 636 (1992) Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

ASTM E 119 (1988) Fire Tests of Building Construction and Materials

ASTM E 1264 (1990) Standard Classification for Acoustical Ceiling Products

UNDERWRITERS LABORATORIES INC. (UL) PUBLICATION:

UL-05 (1985) Fire Resistance Directory

1.2 GENERAL REQUIREMENTS

Acoustical treatment shall consist of sound controlling units mechanically mounted on a suspended ceiling system. The unit size, texture, finish, and color shall be as specified herein. The location and extent of acoustical treatment shall be as shown on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Acoustical Ceiling System; FIO

Manufacturer's descriptive data and installation instructions.

SD-04 Drawings



Acoustical Ceiling System; FIO

Drawings shall show suspension system, method of anchoring and fastening, and reflected ceiling plan.

SD-14 Samples

Acoustical Units; GA

Two samples of acoustical unit showing texture, finish, and color.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials shall be carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical units shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed to assure temperature and moisture conditions.

1.5 ENVIRONMENTAL REQUIREMENTS

A uniform temperature of not less than 16 degrees C (60 degrees F) nor more than 27 degrees C (80 degrees F) and a relative humidity of not more than 70 percent shall be maintained before, during, and after installation of acoustical units.

1.6 SCHEDULING

Interior finish work such as concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above the ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Acoustical units shall conform to ASTM E 1264, Class A, and the following requirements:

2.1.1 Units for Exposed-Grid System

2.1.1.1. Acoustical Tile Ceiling

Type: III
NRC grade: .55 - .65
Pattern: a, b, c, d or f as indicated
Nominal size: 600mm x 600mm (24" x 24")
Edge detail: Trimmed and butt or tegular edge
Finish: Factory-applied white finish.
LR grade: 1.
STC range: 40-44.

Type: XX (Ceramic and mineral fiber composition)
NRC Grade: 55 minimum

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Pattern: a, b, c, d, f or g as indicated
Nominal Size: 600mm x 600mm (24" x 24")
Edge detail: Trimmed and butt
Finish: Factory applied standard white finish
LR grade: 1.
STC range: 40-44

2.2 SUSPENSION SYSTEM

2.2.1. Suspension system for acoustical tiles

Suspension system shall be standard, fire-resistive, exposed-grid, concealed grid, standard width flange, narrow width flange, narrow slotted flange or as shown on the drawings, and shall conform to ASTM C 635 for intermediate-duty or for heavy-duty systems. Surfaces exposed to view shall be aluminum or steel with a factory-applied white baked-enamel finish. Wall molding shall have a flange of not less than 23 mm (15/16 inch) and shall be provided with outside corner caps. Inside corner caps shall be provided where, due to the configuration of the installation, they are needed to produce a workmanlike appearance.

2.3 HANGERS

Hangers shall be galvanized steel wire. Hangers and attachment shall support a minimum 1330 N (300 pound) ultimate vertical load without failure of supporting material or attachment.

2.4 ACCESS PANELS

Access panels shall match adjacent acoustical units and shall be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Panel shall be not less than 300mm x 300mm or more than 300mm x 600mm. An identification plate of 0.8 mm thick aluminum, 19mm in diameter, stamps with the letters "AP" and finished the same as the unit, shall be attached near on corner on the face of the each access panel.

PART 3 EXECUTION

3.1 INSTALLATION

Acoustical work shall be provided complete with all necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings shall not be exposed in the finished work. Hangers shall be laid out for each individual room or space. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels shall be kept clear of abutting walls and partitions. At least two main runners shall be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a suspension system shall be installed, so that all hanger wires will be plumb. Splayed hanger wires may be used if an opposite counter-splayed wire of the same angle as the first wire is installed and attached to the same supporting member.

3.1.1 Suspension System

Suspension system shall be installed in accordance with ASTM C 636 and as specified herein. There shall be no hanger wires or other loads suspended from underside of steel decking.



3.1.1.1 Plumb Hangers

Hangers shall be plumb and shall not press against insulation covering ducts and pipes.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, counter-splaying, or other acceptable means.

3.1.2 Wall Molding

Wall molding shall be provided where ceilings abut vertical surfaces. Wall molding shall be secured not more than 75 mm (3 inches) from ends of each length and not more than 400 mm (16 inches) on centers between end fastenings.

3.1.3 Acoustical Units

Acoustical units shall be installed in accordance with the approved installation instructions of the manufacturer. Edges of acoustical units shall be in close contact with metal supports, with each other, and in true alignment. Acoustical units shall be arranged so that units less than one-half width are minimized. Units in exposed-grid system shall be held in place with manufacturer's standard hold-down clips, if units weigh less than 5 kg per square m (1 psf.)

3.2 CEILING ACCESS PANELS

Ceiling access panels shall be located directly under the items to which access is required.

3.2 CLEANING

Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

--End of Section--



Section 09530 Acoustical Insulation And Barriers

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical insulation and barriers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Leaded Vinyl shall be a loaded vinyl sound barrier product composed of lead, vinyl, and fiberglass reinforcing intended for use as a sound attenuation material. The material shall weigh either 72 or 120 ounces per square yard as required. Material thickness shall be 0.025 inch and 0.050 inch for 72 ounce and 120 ounce material, respectively.

2.2 Foil-Reinforced, Kraft-Faced, Mineral-Fiber Insulation shall be a faced insulation product designed to be used for thermal and acoustical insulation. Mineral fiber insulation shall be in accordance with Fed. Spec. HH-I-558, Form A, Class 1 or 2. Noise reduction coefficient (NRC) shall be not less than 0.55 for 1-inch thickness. Vapor transmission rate shall be not more than 0.02 perms. Surface burning characteristics shall be not more than a flame spread classification of 25, a fuel contribution of 50, and a smoke developed rating of 50, when tested in accordance with UL 723.

2.3 Vapor Barrier Facing Material shall be in accordance with ASTM C 1136, Type I or II as required. Facing material shall be a laminate of aluminum foil and kraft-reinforced mineral fiber scrim.

2.4 Sheet Lead shall be in acoustical attenuating product weighing 1 pound per square foot, with a thickness of not less than 1/64 inch. Lead sheet shall conform to Fed. Spec. QQ-L-201, Grade B.

2.5 Fire Hazard Classification: All acoustical insulation and barrier materials shall bear markings indicating the fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.

3.0 EXECUTION: (Section not used.)



Section 09535 Sound Absorbing Panels

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound absorbing panels. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Perforated Steel Panels shall be modular units, fabricated of 22 gauge zinc-coated steel, and perforated with holes comprising not less than 10 percent of the panel area. Panels shall be suitably stiffened in both directions in accordance with panel size. Panels shall be filled with 2 inch thick, 1.5 lbs/cu ft acoustical insulation meeting Fed. Spec. HH-I-558, Form B, Type 1, Class 7. Installed panel units with acoustical insulation shall have a minimum Noise Reduction Coefficient (NRC) of .70 when tested in accordance with ASTM C 423. Panel units shall be furnished with two coats of white baked-on polyester paint on exposed surfaces and one coat on non-exposed surfaces.

2.2 Fiberglass Wall Panels shall be modular units, fabricated of 1-1/8 inch glass fiber board laminated to a nonwoven needle-punched fabric. The panels shall have a minimum NRC of .80 according to ASTM C 423. Panels shall be furnished with suitable wall fastening system.

2.3 Sound Attenuation Blankets shall be composed of mineral fiber of 4 lbs/cu ft density for 1 inch thickness, and 3 lbs/cu ft density for greater than 1 inch thickness conforming to ASTM C 665. Blanket R-value shall be 4 per inch.

2.4 Fire Hazard Classification: A sound absorbing panel unit and sound attenuation blankets shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.

3.0 EXECUTION:

3.1 Perforated Steel Panels shall be installed on ceiling suspension systems and wall furring systems that are compatible with perforated steel panels and that are already in place.

3.2 Fiberglass Wall Panels shall be installed on substrate wall surfaces that are clean, dry, and continuous, with no surface irregularities.



Section 09560 Wood Strip Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood strip flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wood Strip Flooring shall be manufactured from kiln-dried, plain-sawed, red oak lumber. Flooring shall be select grade, tongue and groove, end-matched, with manufacturer's standard channeling of back face of each strip. Size shall be 3/4 inch thick, 2-1/4 inches wide.

2.2 Maximum Moisture Content shall be 9 percent for wood strip flooring and 14 percent for other wood members.

2.3 Finishing Materials for Job Finished Flooring:

2.3.1 Stain: Penetrating type non-fading wood stain.

2.3.2 Wood Filler: Fed. Spec. TT-F-336.

2.3.3 Sealer: Penetrating type, pliable, wood-hardening finish/sealer.

2.3.4 Varnish: Alkyd resin varnish.

2.3.5 Urethane Finish: Fed. Spec. TT-C-542.

2.3.6 Floor Wax: Liquid, solvent-type, slip-resistant, conforming to Fed. Spec. P-W-158.

2.4 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.

2.5 Nails shall be Fed. Spec. FF-N-105 screw or ring type, zinc coated.

2.6 Asphalt Primer shall comply with ASTM D 41.

2.7 Asphalt Saturated Felt shall be organic, 15-pound, unperforated, complying with ASTM D 226.

2.8 Membrane shall be 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.

2.9 Wood Sleepers shall be No. 1 common, fir, hemlock, spruce, or yellow pine complying with requirements of the rules or standards under which produced with preservative treatment complying with AWPB LP-2.

2.10 Plywood Subflooring shall be DOC PS 1, "C-D INT- APA," with exterior glue, or "C-C EXT-APA."

2.11 Hardboard shall comply with ANSI/AHA A135.4, specially made for underlayment, 1/4 inch thick.

3.0 EXECUTION:

3.1 Preparation:



3.1.1 Wood Subfloors shall be renailed where loose. Where unsatisfactory wood subflooring is removed, replace with new exterior or underlayment grade plywood. Apply hardboard underlayment just before finish floor is to be installed. Nail plywood subfloors with screw-type nails. Cover ground in crawl space with lapped and sealed 4 mil polyethylene or 55-pound rolled roofing, and cover subfloor with a lapped layer of 15-pound asphalt saturated felt.

3.1.2 Concrete Subfloors: Fill large cracks and holes in concrete structural floor slabs with a one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent). Sand or trowel smooth irregularities to within allowable tolerances of NOFMA-01. Apply primer to concrete subfloors avoiding separating the emulsion. Apply two applications of hot asphalt mastic and asphalt saturated felt, then apply an additional layer of asphalt mastic. Provide flat 2 x 4 sleepers, 18 to 30 inches long impregnated with an approved wood preservative and laid in additional asphalt mastic; or apply a polyethylene sheet moisture protection system consisting of two courses of 1 x 2 nailing strips with a layer of polyethylene between, the first course being treated with preservative and adhered to the slab in rivers of mastic supplemented by a 1-1/2 inch concrete nail every 24 inches.

3.1.3 Treated Wood Cuts shall be treated with the original preservative.

3.2. Installation of Wood Strip Flooring:

3.2.1 General: Comply with NOFMA-01.

3.2.2 Expansion Space: For straight running pattern flooring and depending upon the width of pattern to be laid (usually the width of the room), provide approximately 1/2 inch of expansion space under base and base shoe along length of stripping, with approximately half as much space at ends of pattern.

3.2.3 Machine Sand installed unfinished flooring to remove offsets and non-level conditions.

3.2.4 Field Finish floors by applying a coat of wood paste filler and stain, if needed.

3.2.4.1 Natural Finish: Apply two coats of sealer and two coats of floor wax.

3.2.4.2 Varnish Finish: Apply three coats of floor varnish.

3.2.4.3 Urethane Finish: Apply multiple coats of urethane finish to build a dry film thickness of 1.0 mil.



SECTION 09566 WOOD BLOCK INDUSTRIAL FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood block industrial flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wood Block Creosoted Flooring shall be yellow pine, Douglas fir, or upland oak, preservative-treated, and in accordance with ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2, 2 1/2, or 3 inches thick, 3 inches wide, and 6 inches long.

2.2 Wood Block Natural Finish Flooring shall be yellow pine or upland oak, preservative-treated. Wood blocks shall be of the species, quality, and size described in ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2 inches thick, 3 inches wide, and 6 inches long.

2.3 Primer, Adhesive, and Filler shall be provided for wood block creosoted flooring.

2.4 Flexible Filler and Clear Industrial Sealer and Finish Coating shall be provided for wood block natural finish flooring.

3.0 EXECUTION:

3.1 Preparation: Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected and all damaged portions of concrete slabs shall have been repaired. If concrete curing compounds or surface sealers have been applied to the concrete slabs, they shall have been entirely removed from the slabs.

3.2 Installation:

3.2.1 For Wood Block Creosoted Flooring, a coat of priming oil shall be applied to the concrete slab. After the priming oil has dried, a squeegee coat of hot adhesive shall be applied. When the adhesive has hardened, the blocks shall be laid tightly together with the grain vertical. After the floor has been laid, two coats of filler shall be applied by squeegee. Expansion joints shall be provided.

3.2.2 For Wood Block Natural Finish Flooring, the joints shall receive filler and multiple coats of clear sealer and finish coating. Number of coats and method of application shall be adjusted to seasonal conditions.

3.3 Marking Lines: Floor surface in areas to receive lines shall be cleaned by scarification or by wire brushing. At least two coats of a marking material compatible with flooring materials shall be applied with suitable brush or spraying machine. The minimum total thickness of the marking lines shall be 4 mils.



Section 09570 Wood Parquet Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood parquet flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wood Parquet Flooring shall be kiln-dried, plain-sawed, red oak. 2.2 Laminated (Plywood) Wood Block Flooring shall be prime grade, 12-inch x 12-inch x 1/2-inch nominal size, with manufacturer's standard urethane floor finish. Flooring shall be tongue and grooved as required for laying in checkerboard pattern.

2.3 Slat Block Flooring shall be clear grade, factory-prefinished with manufacturer's standard penetrating floor sealer treatment. Flooring shall be 9 inches x 9 inches x 5/16 inch, square pattern, tongue and groove, square edge matching. Pattern units of flooring shall be factory- assemble and adhered to removable paper facing for shipment to the project, or with slats fastened together with metal splines on backs.

2.4 Solid Block Flooring: Wood parquet flooring shall be prefinished in factory. Flooring shall be prime grade, tongue and groove, square edge, matching.

2.5 Plastic Impregnated Parquet Flooring shall be manufacturer's standard fabrication of solid hardwood slat-block parquet flooring, which has been impregnated with acrylic plastic and treated by gamma radiation and factory-finished. Flooring shall be composed of 5/16-inch thick x 6-inch squares fabricated into 12-inch square blocks, square edged, tongued and grooved, with tongue and groove matching.

2.6 Adhesive/Mastic shall be polyvinyl acetate (PVA) or special mastic of type recommended by the flooring manufacturer and complying with flammability and environmental control regulations.

2.7 Finish Materials for Unfinished Flooring:

2.7.1 Stain: Penetrating type non-fading wood stain.

2.7.2 Wood Paste Filler: Fed. Spec. TT-F-336, pigmented if required.

2.7.3 Sealer: TT-S-176, Class I, for white oak and red oak, Class II for beech, birch, and hard maple.

2.7.4 Varnish: Alkyd resin varnish conforming to Fed. Spec. TT-V-109.

2.7.5 Polyurethane Finish: Moisture curing type, polyurethane finish conforming to Fed. Spec. TT-C-542.

2.7.6 Floor Wax: Slip-resistant of a type recommended by flooring manufacturer.

2.8 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.

2.9 Nails and Screws shall be recommended by NOFMA-01.

2.10 Concrete Primer: ASTM D 41.

2.11 Asphalt-Saturated Felt: ASTM D 226.

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2.12 Hardboard Underlayment: ANSI/AHA A135.4.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 For Adhesive Application on Concrete Slab: Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent), examine concrete surfaces and grind irregularities to within allowable tolerances of NOFMA-01, and apply primer to concrete subfloors.

3.1.2 For Adhesive Application on Wood Subflooring or Underlayment: Preparation of subflooring or underlayment shall be in compliance with the printed instructions of the flooring manufacturer.

3.1.3 For Nailed Application on Wood Subflooring or Underlayment: Cover subflooring with a layer of 15-pound asphalt-saturated felt, lap all edges at least 2 inches, and turn felt up at least 2 inches behind baseboards.

3.1.4 For Plastic Impregnated Parquet Flooring: Patch and level concrete subfloors with porous latex cement patching compound. If parquet is to be installed over existing synthetic floor or tongue and grooved subfloor wider than three and one quarter inches, a 1/4-inch plywood or untempered hardboard underlayment.

3.2 Installation:

3.2.1 General: Comply with recommendations and instructions by NOFMA in "Hardwood Flooring Installation Material" and by recommendation of American Parquet Flooring Association, Inc. Where flammable adhesives are used, provide safety sparkproof fans when natural ventilation is inadequate; prohibit smoking, lighting matches, metal heel caps, or any other flame or spark producing device.

3.2.2 Installation of Wood-Block Flooring on Concrete Slabs shall be by adhesive method.

3.2.3 Installation on Wood Subflooring or Underlayment: Apply one layer of saturated felt over wood or underlayment in troweled adhesive, and apply wood blocks with at least two 7-penny spiral or screw type flooring nails per block.

3.2.4 Installation of Plastic Impregnated Parquet Flooring: Install with special adhesive.

3.2.5 Sanding: Machine sand installed unfinished flooring to remove offsets and non-level conditions.

3.2.6 Field Finishing:

3.2.6.1 Base Finish: On same day that final sanding, buffing, and sweeping have been completed, apply a coat of wood paste filler. Apply stain if needed, then apply two coats of sealer.

3.2.6.2 Natural Finish: When floors are dry apply two coats of wax.

3.2.6.3 Varnish Finish: Apply 3 coats of floor varnish.

3.2.6.4 Urethane Finish: Apply urethane finish to build a dry film thickness of 1.0 mil.



Section 09596 Gymnasium Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Flooring shall comply with MFMA grading rules. Wood strips shall be second grade or better, edge cut, hard maple (acer saccharum), pressure treated, and kiln dried.

2.2 Asphalt Primer: ASTM D 41.

2.3 Asphalt Saturated Felt: Organic, 15 pounds unperforated, complying with ASTM D 226.

2.4 Membrane: 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.

2.5 Wood Sleepers: No. 1 common, fir, hemlock, spruce, or yellow pine complying with the rules or standards under which produced, with preservative treatment complying with AWPB LP-2.

2.6 Wood Trim: Provide wood baseboard molding, base shoe molding, and stair risers of same species as the wood flooring. Provide wood stripping, nosings, saddles, and thresholds, of same species and cut as the wood flooring.

2.7 Fibrated Kraft Building Paper: Minimum water-vapor permeability of 35 grams per sq. meter per 24 hours (perms). **2.8 Plywood Subflooring:** DOC PS 1, "C-D INT-APA," with exterior glue; or "C-C EXT-APA."

2.9 Hardboard: ANSI/AHA A135.4, specially made for underlayment, 1/4 inch thick.

2.10 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.

3.0 EXECUTION:

3.1 Installation: Comply with MFMA standards and WSFI standards.

3.2 Expansion Spaces: Provide space at walls and other obstructions, interruptions, and terminations of flooring. Cover spaces with base trim, saddles, and thresholds.

3.3 Resiliently-Mounted Subflooring System: Install two layers of 1/2-inch plywood subflooring over moisture barrier and primed substrate. Nail gymnasium flooring to subflooring.

3.4 Steel Channel Sleeper System: Install moisture barrier over primed substrate. Nail channel sleepers to substrate over resilient channel backer, spaced 12 inches o.c. Lay resilient insulation boards in a continuous course between channel sleepers. Fasten gymnasium flooring with flooring clips.

3.5 Resiliently-Mounted Wood Sleeper System: Install 2 foot or 3 foot wood sleeper units at 12 inches o.c. without anchorage over moisture barrier and primed substrate. Nail gymnasium flooring to wood sleepers.

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3.6 Wood Subflooring and Sleeper System: Anchor sleeper clips to primed substrate, 24 inches o.c., for running sleepers at 16-inch spacing. Flood-coat substrate with 1/8-inch thick pour of hot asphalt. Shim 2 foot or 3 foot wood sleepers level and grout with 1:3 Portland cement-sand grout. Nail clips to sleepers at each juncture. Nail subflooring on sleepers. Cover subflooring with 30-pound, asphalt-saturated felt, with lapped seams. Install wood strip gymnasium flooring to subfloor.

3.7 Steel Spline Flooring on Vapor Barrier System: Prime concrete slab with asphalt primer before applying two layers of 15-pound, asphalt-saturated felt in asphalt mastic. Cover top layer of felt with a smooth continuous layer of asphalt mastic at least 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with saw-toothed steel splines into the slotted ends.

3.8 Steel Spline Flooring on Cork Underlayment System: Vaporproof slabs on grade as described in Section 3.7. Install 1/2-inch thick corkboard or 1/2-inch thick corkroll underlayment in 1/8 inch of asphalt mastic. Over corkboard, trowel on an additional coat of mastic, 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with saw-toothed steel splines into the slotted ends.

3.9 Sanding: Machine sand with coarse, medium, and fine grades of sandpaper, followed by disc sanding with 000 sandpaper. Clean with power vacuum. Proceed immediately with finish.

3.10 Finishing: Apply floor sealer (2 coats). Apply as many coats of gym floor finish as needed to build a minimum dry film thickness of 3 mils. Machine buff with steel wool.



SECTION 09598 SOFTWOOD FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of softwood flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Douglas Fir Wood Strip Flooring, kiln-dried, vertical grain, complying with the requirements of WCLB for Grade C and better flooring.

2.2 Southern Pine Wood Strip Flooring, kiln-dried, edge grain, complying with the requirements of SPIB for Grade C and better.

2.3 Matching: Tongued and grooved, and end matched.

2.4 Pressure Treatment: Where flooring is exposed to the exterior, provide AWPB LP-2 pressure treatment after manufacture of flooring, followed by drying to required moisture content.

3.0 EXECUTION:

3.1 Plank Flooring: For strip flooring of face width over 3-1/4 inches (plank flooring), install two counter-set nails at each end of each piece and spaced not more than 32 inches along length of each piece. Fill holes with matching wood filler.

3.2 Treated Wood: Whenever treated wood flooring must be cut for installation, treat the cut with the preservative used in the original treatment immediately after cutting.



SECTION 09651 RESILIENT FLOORING - CEMENTITIOUS UNDERLAYMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious underlayment for resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Cementitious underlayment shall be one of the following factory-mixed types.

2.1 Magnesium Type: Mixture of sand, magnesium, cement, and/or gypsum. Add water before using.

2.2 Latex Type: Mixture of sand, cement, and latex in dry form to which water is added on the job, or two component type in which latex is added as a liquid on job.

2.3 Polyvinyl Acetate Type: Polyvinyl acetate resins, cement, gypsum, and sand mixtures.

2.4 Epoxy Type: Two-component epoxy type that merely requires mixing of the two parts in compliance with manufacturer's instructions.

2.5 Oxychloride Type: Mixture with cement and with or without magnesium.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 On Wood Subfloors lay 15-pound saturated felt in opposite direction to floor boards. Lap edges three inches.

3.1.2 Place Metal Lath nailed at 6-inch centers over felt.

3.2 Installation:

3.2.1 Install Cementitious Underlayment in strict compliance with instructions for the type of system used.

3.2.2 Where Feather Edges less than 1/4 inch thick are required, use a latex type underlayment for such thin parts of the underlayment.

3.2.3 On Concrete Surfaces apply latex or polyvinyl acetate liquid as a bonding agent before installing underlayment.



SECTION 09660 RESILIENT FLOORING

PART I. GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4078	(1992) Water Emulsion Floor Polish
ASTM E 648	(1994a) Critical Radiant Flux of floor-Covering Systems Using a Radiant Heat Energy Source
ASTM E 662	(1995a) Specific Optical Density of Smoke Generated by Solid Materials
ASTM F 1066	(1995a) Vinyl Composition Floor Tile
ASTM F 1303	(1995) Sheet Vinyl Floor Covering with Backing
ASTM F 1344	(1993) Rubber Floor Tile

FEDERAL SPECIFICATIONS (FS)

FS RR-T-650	(Rev E) Treads, Metallic and Nonmetallic, Skid Resistant
FS SS-T-312	(Rev B; Int Am 1; Notice 1) Tile, Floor: Asphalt, Rubber, Vinyl Vinyl-Asbestos

1.2 FIRE RESISTANCE REQUIREMENTS

Flooring in corridors and exits shall have a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E 648. The smoke density rating shall be less than 450 when tested in accordance with ASTM E 662.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Resilient Flooring and Accessories; FIO

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Manufacturer's descriptive data and installation instructions including cleaning and maintenance instructions.

SD-09 Reports

Resilient Flooring and Accessories; FIO

Copies of test reports showing that representative product samples of the flooring proposed for use have been tested by an independent testing laboratory within the past three years or when formulation change occurred and conforms to the requirements specified.

SD-14 Samples

Resilient Flooring and Accessories; GA

Three samples of each indicated color and type of flooring and base. Sample size shall be minimum 60 by 100 mm (2-1/2 by 4 inches).

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers bearing the manufacturer's name, project identification, and handling instructions. Materials shall be stored in a clean dry area with temperature maintained above 21 degrees C (70 degrees) for 2 days prior to installation, and shall be stacked according to manufacturer's recommendations. Materials shall be protected from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances.

1.5 ENVIRONMENTAL REQUIREMENTS

Areas to receive resilient flooring shall be maintained at a temperature above 21 degrees C (70 degrees F) and below 38 degrees C (100 degrees F) for 2 days before application, during application and 2 days after application. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter.

1.6 SCHEDULING

Resilient flooring application shall be scheduled after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.8 EXTRA MATERIALS

Extra flooring material of each color and pattern shall be furnished at the rate of 5 tiles for each 1000 tiles and 5 square feet for 1000 square feet of sheet flooring installed. Extra materials shall be from the same lot as those installed. Extra base material composed of 6 m (20 linear feet) of each color shall be furnished.

PART 2 PRODUCTS



2.1 VINYL-COMPOSITION TILE

Vinyl-composition tile shall conform to ASTM F 1066, Class 2,(through pattern tile), Composition 1, asbestos-free, and shall be 300mm (12 inches) square and 3.2 mm (1/8 inch) thick. Tile shall have the color and pattern uniformly distributed throughout the thickness of the tile. Flooring in any one continuous area shall be from the same lot and shall have the same shade and pattern.

2.2 SHEET VINYL FLOORING

Sheet vinyl flooring shall be composed of a homogeneous, vinyl composition. Flooring shall be not less than 1800 mm (72 inches)\ wide. Sheet vinyl flooring without backing shall meet the overall thickness 2.03 mm, (.080 inches) composition, flexibility, indentation, and the solvent resistance requirements of ASTM F 1303, Type II. The solid vinyl color and pattern shall extend through the total thickness of the material. High quality vinyl welding rods for heat welding of joints shall be provided.

2.4 RUBBER FLOORING

2.4.1 Rubber Tile

Rubber tile shall conform to ASTM F 1344, Class 1 homogeneous construction, Type A (solid color), 300 mm square (12 inches square). Surface shall be smooth, raised, round, square, diamond or minipastille studs with chamfered edges. Stud profile shall be low. Overall thickness shall be 3 mm (1/8 inch) thick.

2.4.2 Sheet Rubber Flooring

Sheet rubber shall conform to ASTM F 1344 Class 1 homogeneous construction. Type A (solid color) 1 meter (36 inches) wide. Surface shall be smooth or embossed. Overall thickness shall be 3mm (1/8 inch) thick.

2.5 STAIR TREADS, RISERS, AND STRINGERS

Treads, risers, and stringers shall conform to FS RR-T-650 composition A, (rubber) or B, (vinyl). Design shall be either a one piece nosing/tread/riser or a two piece nosing/tread with a matching coved riser. Installation shall include stringer angles on both the wall and banister sides, and landing trim. Surface of treads shall be raised stud, rectangle, diamond, ribbed, pattern, smooth, or smooth with abrasive non-slip inserts.

2.6 RESILIENT BASE

Base shall be manufacturers standard rubber or vinyl, straight style (installed with carpet) or coved style (installed with resilient flooring). Base shall be 100 mm 4 inches high and a minimum 3 mm (1/8 inch) thick. Preformed outside corners shall be furnished.

2.7 INTEGRAL COVED BASE

A vinyl or rubber round cap strip and vinyl or rubber strip with a minimum radius of 19 mm (3/4 inch) shall be provided for integral coved bases as shown.

2.8 FEATURE STRIP

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Feature strips shall be vinyl or rubber, 25 mm (1 inch) wide, and of thickness to match the flooring. Color shall be as indicated.

2.9 TRANSITION STRIP

A vinyl or rubber transition strip tapered to meet abutting material shall be provided.

2.10 ADHESIVE

Adhesive for flooring and wall base shall be as recommended by the flooring manufacturer.

2.11 POLISH

Polish shall conform to ASTM D 4078.

2.12 CAULKING AND SEALANTS

Caulking and sealants shall be in accordance with Section 07920 JOINT SEALING.

2.13 MANUFACTURER'S COLOR AND TEXTURE

Color and texture shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 EXAMINATION/VERIFICATION OF CONDITIONS

The Contractor shall examine and verify that site conditions are in agreement with the design package and shall report all conditions that will prevent a proper installation. The Contractor shall not take any corrective action without written permission from the Government.

3.2 SURFACE PREPARATION

Flooring shall be in a smooth, true, level plane, except where indicated as sloped. Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer. Concrete curing compounds, other than the type that does not adversely affect adhesion, shall be entirely removed from the slabs. Paint, varnish, oils, release agents, sealers, waxers, and adhesives shall be removed, as recommended by the flooring manufacturer.

3.3 \+MOISTURE TEST+

The suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content shall be determined by a moisture test as recommended by the flooring manufacturer.

3.4 INSTALLATION OF VINYL-COMPOSITION TILE AND SOLID VINYL TILE



Tile flooring shall be installed with adhesive in accordance with the manufacturer's installation instructions. Tile lines and joints shall be kept square, symmetrical, tight, and even. Edge width shall vary as necessary to maintain full-size tiles in the field, but no edge tile shall be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Edge tile shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied.

3.5 INSTALLATION OF SHEET VINYL FLOORING

Sheet vinyl flooring shall be installed with adhesive in accordance with the manufacturer's written installation instructions. Flooring shall be fitted to the room by hand cutting, straight scribing, or pattern scribing as necessary to suit job conditions. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Seams shall be cut by overlapping or underscribing as recommended by the manufacturer. Seams and edges of sheet vinyl flooring in room areas shall be bonded or welded as recommended by the manufacturer. Flooring shall be installed with an integral coved base.

3.6 INSTALLATION OF RUBBER FLOORING

Rubber flooring shall be installed with adhesive in accordance with the manufacturer's written installation instructions. Lines and joints shall be kept square, symmetrical, tight, and even. Edge width shall vary as necessary to maintain full-size sheets or tiles in the field, but no edge pieces shall be less than one-half the field size, except where irregular shaped rooms make it impossible. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Edges shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied.

3.7 INSTALLATION OF FEATURE STRIPS

Edge strips shall be secured with adhesive as recommended by the manufacturer. Edge strips shall be provided at locations where flooring termination is higher than the adjacent finished flooring, except at doorways where thresholds are provided.

3.8 INSTALLATION OF RESILIENT BASE

Wall base shall be installed with adhesive in accordance with the manufacturer's written instructions. Base joints shall be tight and base shall be even with adjacent resilient flooring. Voids along the top edge of base at masonry walls shall be filled with caulk.

3.9 INSTALLATION OF TREADS AND RISERS

Stair treads and risers shall be installed with adhesive in accordance with the manufacturer's written installation instructions. Treads and risers shall cover the full width of the stairs. Stairs wider than manufacturer's standard lengths shall have equal length pieces butted together to cover the treads.

3.10 INSTALLATION OF INTEGRAL COVED BASE

Integral coved base shall be formed by extending the flooring material 150 (6 inches) onto the wall surface. Cove shall be supported by a plastic or rubber filler having a minimum radius of 19 mm (3/4 inch). Coved base shall be installed with adhesive in accordance with the

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manufacturer's written instructions. A vinyl cap strip shall be provided at the top of the base. Voids along the top edge of base at masonry walls shall be filled with caulk.

3.11 CLEANING

Immediately upon completion of installation of tile in a room or an area, flooring and adjacent surfaces shall be cleaned to remove all surplus adhesive. After installation, flooring shall be washed with a cleaning solution, rinsed thoroughly with clear cold water, and, except for raised pattern rubber flooring, rubber tile and sheet rubber flooring, rubber stair treads, and static control vinyl tile, given two coats of polish in accordance with manufacturers written instructions. After each polish coat, floors shall be buffed to an even luster with an electric polishing machine. Raised pattern rubber flooring, rubber tile and sheet rubber flooring, rubber stair treads, and static control vinyl tile shall be cleaned and maintained as recommended by the manufacturer.

3.12 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage as recommended by the flooring manufacturer. Flooring which becomes damaged, loose, broken, or curled shall be removed and replaced.

--End of Section--



SECTION 09670 FLUID-APPLIED RESILIENT FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Polyurethane Elastomer Flooring:

2.1.1 Polyurethane Elastomer Flooring shall be a poured-in-place urethane recreational type flooring surface system composed of a two-part urethane component system. Components shall be blended and poured as a liquid onto a prepared base. Primer material to provide adhesion of the polyurethane to the base shall be as recommended by the flooring manufacturer. Line paints shall be polyurethane. Flooring color, thickness, durometer hardness, and painted lines shall be as required.

2.1.2 Physical Properties: Material weight shall be approximately 0.83 pound per square foot per 1/8-inch thickness. Tensile strength shall be 200-600 psi in accordance with ASTM D 412. Hardness range shall be 55-65 Shore A-2 in accordance with ASTM D 2240. Elongation shall be limited to 150-350 percent in accordance with ASTM D 412. Compression set shall be 90 percent immediate recovery after 72 hours at 50 percent compression at 72 F in accordance with ASTM D 395. The material shall provide complete resistance to fungus.

3.0 EXECUTION: Base surface preparation shall be in strict accordance with polyurethane flooring manufacturer's recommendations. Cracks and construction joints shall be filled flush with materials recommended by the manufacturer.



Section 09675 Conductive Vinyl Tile Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive vinyl tile flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Certificate of Conductance: Submit one copy of certificate signed by the Contractor, stating: "Conductive floors were tested by method prescribed in ANSI/UL 779 and were found to have a resistance of less than 1,000,000 ohms and greater than 25,000 ohms."

2.2 Conductive Vinyl Tile: Floor covering shall be of solid, unlaminated construction, manufactured from highest grade materials, with surface smooth, and free from foreign matter. Tile shall be resistant to the action of acids and other materials normally encountered in operating rooms. Tile shall comply with Fed. Spec. SS-T-312, Type III and shall be listed by Underwriters' Laboratories, Inc. Elements of tile shall be so proportioned that the electrically conductive components will not be more than 1/4 inch apart on the top surface. The tile flooring shall have an average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with NFPA 253.

2.2.1 Tile Size: 1/8 inch by 12 inch by 12 inch tiles, micro- squared to ensure tight joints.

2.2.2 Slab Size: 1/8 inch by 36 inch by 36 inch slabs.

2.3 Conductive Adhesive: A two-part chemically setting, water- resisting, epoxy adhesive specially formulated for installing conductive vinyl tile. Adhesive shall form a conductive field under tile without use of copper foil strips.

2.4 Epoxy Calking Cement used to seal the perimeter joint shall be a material recommended by the manufacturer of the flooring.

3.0 EXECUTION:

3.1 Conductive Tile shall be installed by experienced mechanics under the supervision of factory-approved personnel. Install with conductive adhesive. Complete electrical grounding in compliance with the manufacturer's instructions.

3.2 Lay Tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise directed.

3.3 Cleaning: Three days after installation, conductive vinyl tile flooring shall be cleaned thoroughly. Do not apply wax to conductive flooring.

3.4 Testing: After completion of installation, conductive vinyl tile floors shall be tested by qualified technicians employed by the Contractor. Test shall be done in presence of the Contracting Officer. Testing procedure shall comply with ANSI/UL 779.



Section 09680 Colors

PART 1

GENERAL 1.1

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC TM 16 (1998) Test Method: Colorfastness to Light

AATCC TM 134 (1996) Test Method: Electrostatic Propensity of Carpets

AATCC TM 165(1999) Test Method: Colorfastness to Crocking: Carpets

AATCC Crockmeter MethodAATCC TM 174 (1998) Test Method: Antimicrobial Activity Assessment of Carpet

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 297 (1998) Rubber Products - Chemical Analysis

ASTM D 418 (1993; R 1997) Pile Yarn Floor Covering Construction

ASTM D 1423 (1999) Twist in Yarns by the Direct-Counting Method

ASTM D 1667 (1997) Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam)

ASTM D 3278 (1996el) Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D 3676 (1996a) Rubber Cellular Cushion Used for Carpet or Rug Underlay

ASTM D 5252 (1998a) Standard Practice for the Operation of the Hexapod Drum Tester

ASTM D 5417 (1999) Standard Practice for Operation of the Vetterman Drum Tester

ASTM E 648 (1999) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (1996) Commercial Carpet Installation Standard

CODE OF FEDERAL REGULATIONS (CFR)

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16 CFR 1630 Standard for the Surface Flammability of Carpet and Rugs (FF 1-70)

40 CFR 247 Guidelines for Procurement of Products that contain Recycled Material

GERMANY INSTITUTE FOR STANDARDIZATION (DEUTSCHES INSTITUTE FUR NORMUNG)
(DIN)

DIN 54318 (1986) Machine-Made Textile Floor Coverings; Determination of Dimensional
Changes Due to the Effects of Varied Water and Heat Conditions; Identical with ISO 2551 Edition 1981

1.2 SUBMITTALS

Indicate submittal classification in the blank space using "GA" when the submittal requires Government approval or "FIO" when the submittal is for information only. Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330.

SUBMITTAL PROCEDURES:

SD-03 Product Data

Carpet and Accessories; GA

Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory.

Installation; GA

Two copies of the manufacturer's printed installation instruction for the carpet, including preparation of substrate, seaming techniques, and recommended adhesives and tapes.

Recycled Material; GA

Two copies of report stating that carpet contains recycled materials and/or involvement in recycling or reuse program. Report shall include percentage of recycled material

SD-04 Samples

Carpet and Accessories; GA

Carpet: Two "Production Quality" samples 450 x 450 mm (18 x 18 inches) of each carpet proposed for use, showing quality, pattern, and color specified.

Vinyl Moldings: Two pieces of each type at least 300 mm. (12 inches) long.

Special Treatment Materials: Two samples showing system and installation method.

SD-06 Test Reports

Moisture and Alkalinity Tests; GA

Two copies of test reports of moisture and alkalinity content of concrete slab stating date of test, person conducting the test, and the area tested.

SD-07 Certificates

Carpet and Accessories; GA



Certificates of compliance from a laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards and Technology attesting that each type of carpet and carpet with cushion material conforms to the standards specified.

SD-10 Operation and Maintenance Data

Carpet and Accessories; GA

Two copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

1.3 REGULATORY REQUIREMENTS

Carpet and adhesives shall bear the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Carpet type bearing the label will indicate that the carpet has been tested and meets the criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality. Contractor shall procure carpet in accordance with 40 CFR 247, and shall submit a report stating that the carpet contains recycled materials, indicating the actual percentage of recycled material. Contractor shall, as much as possible, select material manufacturers that reduce pollutant and waste, recycle waste, reuse resources and scrap, and reclaim flooring materials instead of disposing into a landfill. Where possible, product shall be purchased locally to reduce the emissions of fossil fuels from transporting.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Materials shall be stored in a clean, dry, well ventilated area, protected from damage and soiling, and shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days prior to installation.

1.5 ENVIRONMENTAL REQUIREMENTS

Areas in which carpeting is to be installed shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days before installation, during installation, and for 2 days after installation. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter for the duration of the contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties including minimum ten (10) year wear warranty, two (2) year material and workmanship and ten (10) year tuft bind and delamination.

1.7 EXTRA MATERIAL

Extra material from same dye lot consisting of BROADLOOM CARPET (full width continuous broadloom) and MODULAR TILE CARPET (uncut carpet tiles) shall be provided for future maintenance. A minimum of two percent of total square meters (square yards) of each carpet type, pattern, and color shall be provided.

PART 2 PRODUCTS

2.1 CARPET TYPE (CPT-1 BROADLOOM)

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Carpet shall be first quality; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Carpet materials and treatments shall be reasonably nonallergenic and free of other recognized health hazards. All grade carpets shall have a static control construction which gives adequate durability and performance.

2.1.1 Physical Characteristics

Carpet shall comply with the following:

- a. Recycle Efforts: Use of carpet cushions containing recovered materials OR use of nylon carpet with backing containing recovered carpet OR use of nylon fiber with recycled content 25 per cent (minimum).
Carpet Construction: Tufted
Type: Broadloom 3.6 m (12 feet) minimum usable carpet width.
Pile Type: Level-loop or Multilevel loop
Pile Fiber: Commercial 100% branded (federally registered trademark) Type 6,6 nylon continuous filament
Yarn Ply: Minimum 2 in accordance with ASTM D 1423.
Gauge or Pitch: Minimum 10 inch in accordance with ASTM D 418.
Stitches or Rows/Wires: Minimum 43.31 per 10cm (11 per inch)
Finished Pile Yarn Weight: Minimum .7370 kg per square meter (26 ounces per square yard). This does not include weight of backings. Weight shall be determined in accordance with ASTM D 418.
 - j. Pile Density: Minimum 5000.
 - k. Dye Method: 100% Solution dyed
- l. Backing Materials: Polypropylene

Performance Requirements

APR (Appearance Retention Rating): Carpet shall be tested and have the Severe ARR (3.5-4.0) when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vetterman) test methods using the number of cycles for short and long term testes as specified.

Static Control: Static control shall be provided to permanently control static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC TM 134.

Flammability and Critical Radiant Flux Requirements: Carpet shall comply with 16 CFR 1630. Carpet in MEDCOM facilities shall have a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E 648.

Tuft Bind: Tuft bind force required to pull a tuft or loop free from carpet backing shall be a minimum 40 N (10 pound) average force for loop.

Antimicrobial: Nontoxic antimicrobial treatment in accordance with AATCC TM 174, Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

Colorfastness to Crocking: Dry and wet crocking shall comply with AATCC TM 165 and shall have a minimum rating of step 4 on the AATCC Color Transference Chart for all colors.

Colorfastness to Light: Colorfastness to light shall comply with AATCC TM 16, Test Option E "Water Cooled Xenon-Arc Lamp, Continuous Light" test and shall have a minimum 4 grey scale rating after 40 hours.



Delamination Strength: Delamination strength for tufted carpet with a secondary back shall be minimum of 440 N/m (2.5 lb./inch).

2.2. CARPET TYPE CPT-2 (MODULAR CARPET TILE)

Carpet shall be first quality; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Carpet materials and treatments shall be reasonably nonallergenic and free of other recognized health hazards. All grade carpets shall have a static control construction which gives adequate durability and performance.

2.2.1 Physical Characteristics

Carpet shall comply with the following:

- a. Recycle Efforts: Use of carpet cushions containing recovered materials OR use of nylon carpet with backing containing recovered carpet OR use of nylon fiber with recycled content 25 per cent (minimum) .
- b. Carpet Construction: Tufted.
- c. Type: Modular tile 450mm x 450mm (18x18) inches square OR 500mm x 500mm (20x20) inches square with 0.15 percent growth/shrink rate in accordance with DIN 54318.
Pile Type: Level-loop or Multilevel loop
- e. Pile Fiber: Commercial branded Type 6,6 nylon continuous filament
- f. Yarn Ply: Minimum 2 in accordance with ASTM D 1423.
- g. Gauge or Pitch: Minimum 10 inch in accordance with ASTM D 418.
- h. Stitches or Rows/Wires: : Minimum 43.31 per 10cm (11 per inch)
- i. Finished Pile Yarn Weight: : Minimum .7370 kg per square meter (26 ounces per square yard). This does not include weight of backings. Weight shall be determined in accordance with ASTM D 418.
- j. Pile Density: Minimum 5000
- k. Dye Method: Solution dyed
- l. Backing Materials: Primary backing materials shall be those customarily used and accepted by the trade for each type of carpet. Secondary backing to suit project requirement shall be those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is provided.

Performance Requirements

- a. APR (Appearance Retention Rating): Carpet shall be tested and have the Severe ARR (3.5-4.0) when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vetterman) test methods using the number of cycles for short and long term testes as specified.
- b. Static Control: Static control shall be provided to permanently control static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC TM 134.
- c. Flammability and Critical Radiant Flux Requirements: Carpet shall comply with 16 CFR 1630. Carpet in MEDCOM facilities shall have a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E 648.
- d. Tuft Bind: Tuft bind force required to pull a tuft or loop free from carpet backing shall be a minimum 40 N (10 pound) average force for loop.

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e. Antimicrobial: Nontoxic antimicrobial treatment in accordance with AATCC TM 174, Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

f. Colorfastness to Crocking: Dry and wet crocking shall comply with AATCC TM 165 and shall have a minimum rating of step 4 on the AATCC Color Transference Chart for all colors.

Colorfastness to Light: Colorfastness to light shall comply with AATCC TM 16, Test Option E "Water Cooled Xenon-Arc Lamp, Continuous Light" test and shall have a minimum 4 grey scale rating after 40 hours.

h. Delamination Strength: Delamination strength for tufted carpet with a secondary back shall be minimum of 440 N/m (2.5 lb./inch).

ADHESIVES AND CONCRETE PRIMER

2.3.1 BROADLOOM CARPET.

Adhesives and concrete primers for installation of carpet shall be waterproof, nonflammable, meet local air-quality standards, and shall be as required by the carpet manufacturer. Seam adhesive shall be waterproof, nonflammable, and nonstaining as recommended by the carpet manufacturer.

2.3.2 MODULAR TILE CARPET.

Release adhesive for modular tile carpet shall be as recommended by the carpet manufacturer. Adhesives flashpoint shall be minimum 60 degrees C (140 degrees F) in accordance with ASTM D 3278.

2.4 MOLDING

Vinyl molding shall be heavy-duty and designed for the type of carpet being installed. Floor flange shall be a minimum 50 mm (2 inches) wide. Color shall match the resilient wall base used on the project.

2.5 TAPE

Tape for seams for broadloom carpet shall be as recommended by the carpet manufacturer for the type of seam used in installation.

2.6 COLOR, TEXTURE, AND PATTERN

Color, texture, and pattern shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Carpet shall not be installed on surfaces that are unsuitable and will prevent a proper installation. Holes, cracks, depressions, or rough areas shall be repaired using material recommended by the carpet or adhesive manufacturer. Floor shall be free of any foreign materials and swept broom clean. Before beginning work, subfloor shall be tested with glue and carpet to determine "open time" and bond.



3.2 MOISTURE AND ALKALINITY TEST

Concrete slab shall be tested for moisture content and excessive alkalinity in accordance with CRI 104.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Installation of the carpeting shall not commence until concrete substrate is at least 90 days old. The concrete surfaces shall be prepared in accordance with instructions of the carpet manufacturer. Type of concrete sealer, when required, shall be compatible with the carpet.

3.4 INSTALLATION

Installation shall be in accordance with the manufacturer's instructions and CRI 104. Edges of carpet meeting hard surface flooring shall be protected with manufacturer's recommended transition molding. Installation shall be in accordance with the molding manufacturer's instructions.

Broadloom Installation

Broadloom carpet shall be installed direct glue down or pre-applied adhesive glue down and shall be smooth, uniform, and secure, with a minimum of seams. Seams shall be uniform, unnoticeable, and treated with a seam adhesive. Side seams shall be run toward the light where practical and where such layout does not increase the number of seams. Breadths shall be installed parallel, with carpet pile in the same direction. Patterns shall be accurately matched. Cutouts, as at door jambs, columns and ducts shall be neatly cut and fitted securely. Seams at doorways shall be located parallel to and centered directly under doors. Seams shall not be made perpendicular to doors or at pivot points. Seams at changes in directions of corridors shall follow the wall line parallel to the carpet direction. Corridors with widths less than 1.8 m (6 feet) shall have the carpet laid lengthwise down the corridors.

Modular Tile Installation

Modular tiles shall be installed with release adhesive and shall be snugly jointed together. Tiles shall be laid in accordance with manufacturer's recommended installation guidelines with accessibility to the subfloor where required.

3.5 CLEANING AND PROTECTION

Cleaning

After installation of the carpet, debris, scraps, and other foreign matter shall be removed. Soiled spots and adhesive shall be removed from the face of the carpet with appropriate spot remover. Protruding face yarn shall be cut off and removed. Carpet shall be vacuumed clean.

Protection

The installed carpet shall be protected from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Edges of kraft paper protection shall be lapped and secured to provide a continuous cover. Traffic shall be restricted for at least 45 hours. Protective covering shall be removed when directed by the Contracting Officer.

REMNANTS

Remnants remaining from the installation, consisting of scrap pieces more than 600 mm (2 feet) in

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dimension with more than 0.6 square meters (6 square feet) total, shall be provided. Non-retained scraps shall be removed from site and recycled appropriately.



Section 09685 Carpeting

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of carpeting. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Carpet Cushions:

2.1.1 Rubberized Fiber-Hair Cushion: Burlap fabric reinforcing between top and bottom feltings of blended India jute fiber and new animal hair, less than 90 percent fiber and more than 10 percent hair, 5 oz/sq yd or more of rubberized coating on top surface and on bottom surface complying with Fed. Spec. DDD-C-001023, Type II. Weight shall be 39 oz/sq yd.

2.1.2 Ripple-Type Rubber: Sponge or foam rubber, molded with a rippled or waffled bottom surface, with an adhered top reinforcement of burlap or other fabric complying with Fed. Spec. ZZ-C-00811, Type I, Class 1 (firm), 1/4 inch thick.

2.1.3 High-Density Foam: Open-cell, homogenized latex-rubber, compounded for maximum moisture and aging resistance with ash and filler content not exceeding 50 percent, skinned-over on bottom surface, reinforced on top surface with an adhered fabric. Waffle pattern shall comply with Fed. Spec. ZZ-C-00811, Type I, Class 1, 1/4 inch thick.

2.1.4 Rebonded Polyurethane: Manufacturer's standard formulation of polyurethane foam and binders, to produce a flat carpet cushion complying with Fed. Spec. L-C-001676, Class I, 3/8 inch thick.

2.2 Carpet:

2.2.1 Carpet Fiber (Filament) and Yarn: Fed. Spec. DDD-C-95.

2.2.1.1 Wool: Natural, long staple, virgin wool carpet fiber, not less than 97 percent pure; permanently treated for resistance to insects and mildew.

2.2.1.2 Continuous Hollow Nylon: Continuous multiple hollow-core filament, of manufacturer's standard denier, texturized or crimped for "bulk", delustered with maximum of 15 percent delustrant.

2.2.1.3 Continuous Multilobal Nylon: Continuous nylon filament, of approximately 18 denier, in tri-lobal or similar cross section (not round or ovular), texturized for "bulk."

2.2.1.4 Continuous Round Nylon: Continuous round nylon filament, of not less than 15 denier, texturized or crimped for "bulk," delustered with maximum of 15 percent delustrant.

2.2.1.5 Continuous Nylon: Continuous nylon filament of type recommended by carpet manufacturer, approximately 15 denier, texturized or crimped for "bulk," delustered.

2.2.1.6 Staple Nylon: Long staple (approximately 7 inches) nylon fiber, of varying denier and crimp to resemble natural wool, delustered.

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2.2.1.7 Acrylic: Long staple (approximately 7 inches) acrylic fiber, of not less than 15 denier average, crimped to increase "bulk."

2.2.1.8 Modacrylic: Long staple (approximately 7 inches) modified acrylic fiber, modified to increase melting temperature, of not less than 15 denier average, crimped to increase "bulk."

2.2.1.9 Bi-Component Acrylic: Long staple (approximately 7 inches) 2-component acrylic fiber with differential shrinkage characteristic, which imparts spiral crimp for very high "bulk."

2.2.1.10 Polypropylene: Continuous polypropylene (olefin) filament, of 15 denier minimum, textured for "bulk."

2.2.1.11 High-Denier Polypropylene: Continuous filament or long staple polypropylene (olefin) fiber, of 75 denier minimum, textured for bulk, produced specifically for felted or needlepunched construction of carpet.

2.2.1.12 Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, textured for "bulk," specifically compounded for high stain resistance.

2.2.1.13 Nylon-Reinforced Vinyl: Continuous filament nylon thread, coated with vinyl to form a carpet yarn, produced specifically for woven (non-pile) carpet construction.

2.2.1.14 Stain-Resistant Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, unless otherwise indicated, textured for "bulk," specifically compounded for high stain resistance.

2.2.1.15 Destatic Fiber: Metallic carpet fiber, of stainless steel, aluminum, or other metal, either coated or plain, proven by test of round nylon filament pile carpet to be effective in controlling the static buildup in persons to below 3,000 volts when used in one of the following blends of fiber with ambient condition of 20 percent relative humidity and 70 F temperature, with oak-tanned, leather-soled shoes:

- a. 0.33 percent of stainless steel filament.
- b. 3.0 percent blend of plastic coated aluminum filament.

2.2.1.16 Pile Yarn, General: Provide yarn spun in manner recommended by yarn manufacturer and carpet manufacturer.

2.2.2 Carpet Construction:

2.2.2.1 General: Fabricate carpet by the construction method used in manufacturer's standard process.

2.2.2.2 Pile Density; Pitch and Rows: Fabricate carpet with the spacing of tufts both ways, uniformly spaced by manufacturer's standard method.

2.2.2.3 Variation of Yarn and Density: Wherever the texture or pattern of the completed carpet is not affected and also wherever the effect produced is acceptable to the Contracting Officer, the carpet manufacturer may (at his option) vary both the denier of the yarn and the density of the tufts, provided the product of the two remains constant and equal to the product of yarn denier and tuft density indicated (equal density factor maintained.)

2.2.2.4 Pile Height: Provide pile height as designated.

2.2.2.5 Primary Backing for Tufting: Provide manufacturer's standard backing material, but not less than one of the following:



2.2.2.5.1 Polypropylene: Woven polypropylene fabric weighing not less than 3.2 oz/sq yd.

2.2.2.5.2 Plastic Fabric: A non-woven fabric of 75 percent polypropylene fibers and 25 percent other plastic fibers, weighing not less than 4.0 oz/sq yd.

2.2.2.5.3 Jute: Woven jute fabric, weighing not less than 9.0 oz/sq yd.

2.2.2.6 Adhesive Binding for Tufting: Provide manufacturer's standard liquid latex or other resinous coating as required to produce the tuft bind strength indicated, but not less than 20 oz coating/sq yd.

2.2.2.7 Backing for Woven Carpet: Provide manufacturer's standard shot (weft), chain (warp), filler, and stuffer yarns, of jute, kraftcord, cotton, or synthetic fibers. Provide the number of yarns per row or pitch of pile as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but provide not less than 2 shot yarns (3 Axminster) and double chain yarn. Provide woven-through-the-back construction.

2.2.2.8 Back Coating for Woven Carpet: Provide manufacturer's standard liquid latex or other resinous coating, but not less than 10 oz/sq yd. 2.2.2.9 Backing for Knitted Carpet: Provide manufacturer's standard chain (warp) yarns of cotton or synthetic fibers and filler yarns of jute or kraftcord. Provide the number of yarns per row or pitch as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but not less than double chain yarns and double overlapping filler yarns.

2.2.2.10 Back Coating for Knitted Carpet: Liquid latex or other resinous coating, shall be more than 14 oz/sq yd.

2.2.2.11 Backing for Fusion-Bonded Carpet: Provide manufacturer's standard jute or synthetic fabric backing with latex or vinyl plastic coating for fusion-bonding of face pile.

2.2.2.12 Backing for Needle-punched Carpet: Type and weight designated or, if not designated, manufacturer's standard backing fabric produced specifically for needle-punching and felting of staple fibers to produce carpet, complying with Fed. Spec. DDD-C-001173 for construction of needle-punched carpet.

2.2.2.13 Secondary Fabric Backing: Provide, as a minimum, 8-ounce burlap or jute fabric, laminated to carpet with liquid latex adhesive, to achieve a stripping bond of not less than 2.0 lbs in. (Fed. Std. 191).

2.2.3 Dyeing Method: Carpet shall meet the requirements of both the wet-method color fastness rating of "Good" or better, per Fed. Spec. DDD-C-95, evaluated by Method 5610 of Fed. Std. 191 and the fade resistance established by the Association of Textile Chemists and Colorists for carpet when tested on the Atlas Fadeometer for the number of hours indicated. If method of dyeing and fade resistance are not indicated, use manufacturer's standard method, as needed to achieve a fade resistance of 40 hours.

2.2.4 Flame Spread: Carpet shall comply to UL 992 flame propagation index of less than 4.0 and Fed. Std 372, minimum average critical radiant flux of 0.50 watts per square centimeter. Carpet shall pass the methamine tablet test per DOC-FF-1-70 (pill test).

2.3 Bonded Cushion Carpet:

2.3.1 High Density Foam Backing: Open-cell homogenized latex-rubber compound for maximum moisture and aging resistance, with ash or filler content not exceeding 50 percent, skinned-over on exposed surface, complying with Fed. Spec. DDD-C-95, Class I, 38 oz/sq yd, 1/8 inch thick. Compression resistance shall be

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5 pounds minimum. Compression set shall be 15 percent maximum. Provide special formulation, tested with carpet for flame spread rating of less than 75 when by the tunnel test of ASTM E 84, or flame propagation index of less than 4.0 when tested by the UL chamber test, UL 992. Carpeting and cushion shall be tested together.

2.3.2 Primary Backing: Polypropylene weighing 3.5 oz/sq yd minimum.

2.3.3 Bonded Cushion Backing: Provide cushion bonded to carpet to achieve a stripping bond of not less than 2.0 lbs/in (Fed. Std. 191A), either cured-in-place or laminated sheet stock. At manufacturer's option, back coating used as tuft binding may be decreased or eliminated with the use of cured-in-place backing, provided required tuft bind strength is achieved.

2.4 Adhesive for Carpet: Waterproof, release type adhesive as recommended by the carpet manufacturer or cushion manufacturer. Provide adhesive that complies with flame spread rating required for the carpet installation, if any.

2.5 Adhesive for Seams: Waterproof, nonstaining adhesive furnished or recommended by the carpet manufacturer that complies with flame spread rating required for the carpet.

2.6 Carpet Edge Guard: Bend-down type of formed or extruded aluminum carpet edge guard stripping. Form units with concealed teeth to grip the carpet from below.

2.7 Tackless Carpet Stripping: Water-resistant plywood stripping, with angular pins protruding from the top. Provide stripping with 2 rows of pins wherever the carpet width is less than 20 feet and with 3 rows of pins wherever carpet width is 20 feet or more. Provide prenailed stripping, ready for anchorage to concrete or similar substrate.

2.8 Tape:

2.8.1 Cushion Tape: Singel Face cloth, 2 inches wide.

2.8.2 Carpet Tape: Double-face cloth, 2 inches wide.

2.8.3 Seam Tape: Paperback, for latex sewing, 4 inches wide.

2.8.4 Seam Tape: Heat bonding, 4 inches wide.

2.9 Seam Thread: No. 18 waxed linen.

2.10 Masonry Nails: No. 9 (0.148 inch x 1 inch) hardened masonry nails, Fed. Spec. FF-N-105.

2.11 Latex Underlayment: One- or two-component, factory-mixed product containing powdered or liquid latex, cement, and other powders.

2.12 Crack Filler: Type and brand recommended by carpeting manufacturer.

2.13 Hardboard: AHA A135.4, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.

2.14 Plywood: DOC PS 1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.



2.15 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Fill Large Cracks and Holes in concrete structural floor slabs with a one-part, nonshrinking cement to three-part sand grout with a latex or epoxy additive. All ridges or other uneven surfaces shall be ground smooth; chalky or dusty surfaces shall be primed.

3.1.2 Level Floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.

3.1.3 Wood Floor Surfaces: Knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter shall be filled with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth.

3.1.4 Wood Underlayment and Subfloors shall be renailed where loose.

3.1.5 Rotted, Broken or Otherwise Unsatisfactory Wood Subflooring and all other defective materials shall be removed and replaced with new.

3.1.6 Undercut Wood Door Bottoms as required to allow clear door swing over newly carpeted areas.

3.2 Installation:

3.2.1 Install Carpet Edge Guard at every location where edge of carpet is exposed to traffic, except where another device, such as an expansion joint cover system or threshold, is indicated with an integral carpet binder bar.

3.2.2 Installation On Stairs: Install carpet by nailing or other secure method recognized to be durable and safe for traffic on stairs. Conceal edges. Avoid seams at points of high wear (nosings and treads). Cushion on stairs shall be twice the thickness of cushions on floor.



SECTION 09710 MAGNESIUM OXYCHLORIDE FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of magnesium oxychloride flooring and base. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Magnesium Oxychloride Composition: Manufacturer's standard product shall comply with Mil. Spec. MIL-D-16680. Color to be used will be selected by the Contracting Officer from manufacturer's standard colors.

2.1.1 Mixing Solution: Magnesium chloride flake in a 22 degree Baume solution.

2.1.2 Physical Properties when tested in compliance with Mil. Spec. MIL-D-16680:

Fire Resistance: Incombustible

Water Absorption: Less than 7 percent

Abrasion Resistance: 0.072 inch

Impact Resistance: 0.031 inch; no chipping, crackling or detachment.

2.2 Saturated Felt: ASTM D 250, 15-pound type.

2.3 Expanded Metal Lath: ASTM C847, diamond mesh pattern, expanded copper alloy steel, weighing 3.4 pounds per square yard.

2.4 Bonding Agent: Trowel-applied bonding medium made by manufacturer of magnesium chloride.

3.0 EXECUTION:

3.1 Environmental Conditions: Installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F and rising and is maintained above 50 F without interruption while the work is being done and for at least three days after the completion of the work.

3.2 Preparation:

3.2.1 Concrete Floors shall be clean and free from all grease, dirt, paint, and all other foreign matter and shall be completely dry prior to flooring installation.

3.2.2 Wood Floors shall be structurally sound, firmly nailed, free of vibration, and broom clean. Lay felt over wood in opposite direction to joints in wood and overlap edges 3 inches.

3.3 Installation: Apply flooring and base to a uniform 1/2-inch thickness and steel-trowel to a uniform smooth density. Where cover base is installed over wood, trowel material on metal lath. Light traffic may be permitted 24 hours after installation and heavy traffic after 3 to 5 days.



SECTION 09720 EPOXY FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of epoxy flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Component materials for any one flooring type shall be from a single manufacturer. Cove bases of flooring material shall be provided if required.

2.2 Epoxy Quartz Chip Flooring shall be decorative floor surfacing system consisting of primer; topping including epoxy resin, hardener, and ceramic-coated quartz aggregate; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,800 psi (ASTM C 579), a flexural strength of 6,000 psi (ASTM C 580), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.06 percent (ASTM C 413). Tests of chemical resistance of cured resin, when immersed for 7 days in reagents, shall show no effect from ammonium hydroxide, carbon tetrachloride, citric acid, dimethyl formamide, formaldehyde (3 percent), heavy-duty detergent, heptane, hydrogen peroxide (28 percent), lactic acid, oleic acid, phenol solution, sodium carbonate (20 percent), sodium chloride (10 percent), sodium hydroxide (60 percent), sodium hypochlorite, sulfuric acid (30 percent), and urine.

2.3 Epoxy Flooring shall be industrial floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Physical properties of topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 7,500 psi (ASTM C 579), a tensile strength of 1,750 psi (ASTM C 307), a flexural strength of 3,000 psi (ASTM D 790), and a maximum thermal coefficient of linear expansion of 20 by 10⁻⁶ in/in/degrees F (ASTM D 696). The extent of burning shall be 0.25 inches maximum (ASTM D 635). Minimum bond strength shall be 200 psi, with 100 percent concrete failure (ACI 503, Appendix A). Abrasive resistance shall be 0.20 grams maximum (ASTM D 1044, 1,000 Grams, 1,000 Cycles). Impact strength, except topping bonded to concrete, shall be 0.05, with no chipping, cracking, or detachment of surfacing from concrete (MIL-D-3134, Para. 4.7.3). Tests of chemical resistance of cured resin when immersed 7 days in reagents, shall show no effect from acetic acid (5 percent), ammonium hydroxide (10 percent), citric acid (50 percent), cola syrup, fatty acid, motor oil (20W), hydrochloric acid (10 percent), salt water, sodium hydroxide (10 percent), sulfuric acid (10 percent), trisodium phosphate (5 percent), and water (distilled). There shall be only slight softening from ethyl alcohol (95 percent), jet fuel JP-4C, and mineral spirits. There shall be no effect but slight stain from nitric acid (10 percent).

2.4 Chemical-Resistant Epoxy Flooring shall be chemical-resistant floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,500 psi (ASTM C 579), a flexural strength of 2,080 psi (ASTM C 580), an impact strength of 120 in. lbs (ASTM D 2794), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.04 percent (ASTM C 413). Tests of chemical resistance of cured floor surfacing system, when immersed for 7 days in reagents listed, shall show no effect from acetic acid (100 percent), chromic acid (10 percent), citric acid (20 percent), formaldehyde (37 percent), heavy-duty detergent, hydrochloric acid (37 percent), hydrogen peroxide (28 percent), lactic acid (85 percent), mineral spirits, nitric acid (40 percent), oleic acid, oxalic acid (10 percent), phosphoric acid (85 percent), potassium

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hydroxide (50 percent), sulfuric acid (75 percent), tannic acid (20 percent), tartaric acid (10 percent), and urine.

2.5 Epoxy Terrazzo Flooring shall be decorative floor surfacing consisting of primer, thermosetting epoxy resin matrix, decorative mineral aggregate, epoxy grout, and sealer. Heavy brass, 1/4-inch divider strips, and expansion joints shall also be provided as required. Materials shall conform to applicable National Terrazzo and Mosaic Association (NTMA) publications. Flooring, when tested in accordance with the standards, shall show no toxicity. Epoxy terrazzo flooring shall be self-extinguishing when tested in compliance with ASTM D 635.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete Surfaces shall comply with ASTM C 811 unless otherwise indicated or required by manufacturers' instructions.

3.1.2 Wood Floors shall have contaminants removed by sanding, solvent cleaning, detergent cleaning, or other methods as required.

3.1.3 Primer Shall Be Applied over prepared substrate.

3.2 Installation:

3.2.1 Epoxy Quartz Chip Flooring, Epoxy Flooring and Chemical-Resistant Epoxy Flooring shall have a topping mix of aggregates and/or fillers trowel-applied to the following thicknesses:

- a. Epoxy quartz chip flooring: 1/4 inch.
- b. Epoxy flooring: 3/16 inch.
- c. Chemical-resistant epoxy flooring: 1/4 inch.

Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations indicated to form base with cove of radius and height designated. All interior and external corners of base shall be rounded.

3.2.2 Epoxy Terrazzo Flooring shall be applied according to NTMA recommendations and as follows. A 1/4-inch thick aggregate/filler topping mix and recommended curing compound shall be applied and the surface shall then be ground, rinsed, grouted, and reground. Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations designated to form base with cove of radius and height indicated. All interior and external corners of base shall be rounded.



SECTION 09731 CONDUCTIVE ELASTOMERIC LIQUID FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive elastomeric liquid flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Carbon Black shall comply with ASTM D 561.

2.2 Acrylic/Urethane shall be water dispersed acrylic resin mixed with dry components and aggregates. Material shall comply with Mil. Spec. MIL-D-3134. Factory pre-mixed with carbon black.

2.3 Acrylic shall be modified high strength acrylic resin mixed with dry component powders with tensile strength of 4,890 psi, bond strength of 290 psi, and flexural strength of 1,650 psi, minimums, complying with Mil. Spec. MIL-D-3134.

2.4 Neoprene Rubber shall be water-phase neoprene rubber composition complying with NTMA Specifications, with tensile strength of 245 psi, bond strength to concrete of 255 psi, and compressive strength of 2,600 psi, minimums.

2.5 Latex shall be specially formulated, emulsion resin mixed with dehydrated powders. Comply with Paragraphs 3.4 through 3.22 of Mil. Spec. MIL-D-3134, except Paragraph 3.7 shall not apply.

2.6 Epoxy Emulsion shall be 100 percent non-volatile, thermosetting, two-part epoxy resin matrix with tensile strength of 4,000 psi, bond strength of 200 psi, and compressive strength of 14,000 psi.

2.6.1 Water-Emulsified Epoxy Resin shall have the following characteristics:

Viscosity: 180 centipoises at 25 C.

Specific weight: 9.2 pounds per gallon.

Color: opaque white.

Solids (minimum): 59 percent.

Stable after five freeze-thaw cycles.

2.6.2 Water Emulsified Hardener shall have the following characteristics:

Viscosity: 160-190 centipoises at 50 C.

Specific weight: 8.6 pounds per gallon.

Solids (minimum): 75.0 percent.

Stable after five freeze-thaw cycles.

2.7 Polyacrylate: A polyacrylate hydraulic cement copolymer and dry coreactant composite shall comply with requirements of Mil. Spec. MIL-D-3134. 2.8 Polyester: Thermosetting polyester topping resin, catalyst, and premixed fillers shall have tensile strength of 5,000 psi, compressive strength of 14,000 psi, and bond strength of 200 psi, minimums.

2.9 Fillers: Inert mineral or cellulosic material best suited for the resin binders shall be used. Filler in quantity necessary to impart required physical characteristics shall be furnished with particle size not greater than 3/16 inch in any dimension and shall contain sufficient fines to provide an even-textured, nonslip type of surface on the finished topping.

2.10 Primer shall be material that will penetrate into pores of substrate. Primer shall bond with topping to form a permanent monolithic bond between the substrate and the topping.

3.0 EXECUTION:

3.1 Environmental Conditions: Elastomeric liquid flooring installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F. and rising, and is maintained above 50 F. without interruption while the work is being done and for at least three days after the completion of the work.

3.2 Installation Over Wood Floors: Renail wood subfloors where loose, using annular or ring type zinc-coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials.

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3.3 Installation Over Concrete Floors: Roughen surfaces that are glossy, painted, or have loose surface material. Fill large cracks and holes.

3.4 Cleaning: Thoroughly clean all surfaces to receive flooring to remove all grease, oil, wax, dirt, dust, and other foreign matter.

3.5 Topping: Install topping 1/8 inch thick for epoxy type and 1/8 to 3/8 inch thick for other types.

3.6 Bases shall be cover type cast-in-place with 1-inch radius cove and shall be 6 inches high.

3.7 Finish or Sealer Coat shall be applied.

3.8 Testing: After completion of installation, test conductive floors. Test must prove that conductive floors comply with all requirements of ANSI/UL 779.



SECTION 09740 HEAVY-DUTY CONCRETE FLOOR TOPPING

1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of heavy-duty concrete floor topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Portland Cement: Comply with ASTM C 150, Type I or Type III.

2.2 Aggregate: Selected, clean, hard, and tough material, either crushed or natural, as approved by the Contracting Officer. Trap rock, granite, quartz, corundum, or manufactured products such as silicon carbide or heat-treated aluminum oxides are acceptable. They shall comply, in all respects except gradation, with ASTM C 33.

2.3 Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.

3.0 EXECUTION:

3.1 Preparation: Roughen surfaces of present concrete that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.

3.2 Installation: Nominal mixture shall be one part of Portland cement, one part of fine aggregate, and two parts of coarse aggregate by volume. Not more than four gallons of mixing water shall be used for each bag of Portland cement in the mixture. Mixing of concrete shall continue for at least one minute after all ingredients are in mixer.

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SECTION 09741 ARMORED FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of armored flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Premixed Topping: Specially factory formulated topping mix of Portland cement, ASTM C 150 Type I or III, iron aggregate and plasticizer designed to produce 28 day compressive strength of over 8,000 psi.

2.2 Water: Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.

3.0 EXECUTION:

3.1 Preparation: Roughen surfaces of present concrete floor that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.

3.2 Installation: Mix premixed topping and water in a paddle type mixer for three minutes. Place topping over prepared concrete slab to a thickness of 3/4 to one inch. Float and machine trowel as recommended by manufacturer. A shake of premixed topping shall be added. Hand trowel to a smooth hard finish. Cure by applying curing membrane complying with ASTM C 309.



SECTION 09750 BRICK FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Brick Materials:

2.1.1 Light Traffic Paving Brick: ASTM C 902, Class SX, MX, or NX, Type I, II, or III, Application PS, PX, or PA.

2.1.2 Chemical-Resistant Brick: Solid brick, ASTM C 279, Type H or L.

2.1.3 Industrial Floor Brick: Solid brick, ASTM C 410, Type T, H, M, or L.

2.1.4 Base: Matching base shall be provided at walls and vertical elements, including stretcher units, internal and external corners, stops, and other locations as required. Type shall be square-top cove, round-top cove, or turn-up base.

2.1.5 Lining Units shall be brick units matching floor brick for lining pits and trenches and for curbs and pads occurring in floor brick field. Provide special trim shapes for continuous coverage of sub-strates.

2.1.6 Temporary Coating: Wax shall be compatible with cleaning method required to remove wax without damage to grout or brick.

2.2 Setting Materials:

2.2.1 Mortarless Applications:

2.2.1.1 Roofing Felt: ASTM D 226, 15-pound asphalt-saturated felt.

2.2.1.2 Fine Aggregate for Setting Bed: ASTM C 144 or stone screenings.

2.2.1.3 Sand for Joints: ASTM C 144, free of clay particles.

2.2.2 Portland Cement Applications:

2.2.2.1 Portland Cement: ASTM C 150, Type I, natural color or white, to produce the required color of mortar or grout.

2.2.2.2 Aggregate: ASTM C 144 or C 404, or both.

2.2.2.3 Liquid Admixture for Setting Bed and Grout: Liquid latex mortar additive with a compressive strength of 3,000 psi, bond strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at an ozone concentration of 200 pphm and water absorption of 4 percent maximum.

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2.2.2.4 Bond Coat Admixture: High strength liquid latex mortar additive with a compressive strength of 5,000 psi, bond strength of 500 psi, tensile strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at 200 pphm, and water absorption of 4 percent maximum.

2.2.2.5 Pigments: Commercial iron oxide, manganese dioxide, ultra-marine blue, chromium oxide, or carbon black, suitably compounded for use in mortar mixes.

2.2.2.6 Water: Clean and free of deleterious materials which would impair strength or bond.

2.2.3 Chemical-Resistant Mortar and Grout:

2.2.3.1 Sulfur Mortar: ASTM C 287, with silica or carbon filler.

2.2.3.2 Resin Mortar: Liquid resin and filler material shall comply with ASTM C 395. Resin shall be phenolic, furan, polyester, epoxy, or vinylester. Filler shall be silica or carbon.

2.2.3.3 Resin Grout: ASTM C 658, epoxy or furan.

2.2.3.4 Chemical-Resistant Membrane: Multiple-component asphaltic system consisting of asphalt primer and bituminous-coated glass fiber cloth embedded in hot-melt asphalt compound.

2.2.3.5 Expansion Joint Filler: Elastomeric sealant of type recommended and produced by mortar/grout manufacturer for type of application indicated. Include primer and backer rod where required.

2.2.4 Miscellaneous Materials:

2.2.4.1 Cleavage Membrane: 15-pound asphaltic felt, ASTM D 226, Type I, or 4-mil polyethylene sheeting, ASTM C 171.

2.2.4.2 Setting Bed Reinforcement: 2 inches by 2 inches, 16/16, welded wire fabric.

2.2.4.3 Sealer: Phenolic type or acrylic base non-slip material.

3.0 EXECUTION:

3.1 Expansion and Control Joints: Provide sealant-filled joints at locations and widths required. Install expansion joint filler where sealant type joints are required in chemical-resistant flooring.

3.2 UngROUTED Mortarless Brick Flooring:

3.2.1 Cushioning Material: Install roofing felt, two layers with edges butted to achieve uniform thickness, and fine aggregate setting bed screeded to depth required.

3.2.2 Lay Bricks and fill joints with sand. After all bricks are in place and all joints are filled, remove excess sand.

3.3 Latex-Modified Portland Cement Applications:

3.3.1 Apply Cement Slush Coat not to exceed 1/16 inch thickness.

3.3.2 Mix Portland Cement, Sand, and Liquid Admixture.



3.3.3 Spread and Screed Setting Bed to uniform thickness at subgrade elevations required.

3.3.4 Place Brick before initial set of cement occurs. Tamp and beat bricks to obtain full contact with setting bed.

3.3.5 Grout Joints as soon as possible after initial set of setting bed and cure grout.

3.4 Chemical-Resistant Sulfur Mortar Applications shall comply with ASTM C 287 unless otherwise directed.

3.5 Chemical-Resistant Resin Mortar Applications:

3.5.1 Bricklaying: Except as otherwise directed, bricklaying shall comply with ASTM C 399.

3.5.2 Tile Setting: Except as otherwise directed, tile setting shall comply with ANSI/ASTM C 723.

3.5.3 Chemical-Resistant Membrane: Provide chemical-resistant asphaltic membrane system over concrete substrates under chemical-resistant mortar applications where directed.

3.5.4 Set Bricks on Vertical Surfaces in compliance with ASTM C 399, using either resin mortar or sulfur as bed joint material, as required.

3.6 Chemical-Resistant Cement Mortar and Resin Grout Applications:

3.6.1 Application of brick in hydraulic cement mortar setting bed shall comply with ASTM C 398. Grouting joints with resin grout shall comply with ASTM C 723, unless otherwise directed.

3.6.2 Install Cleavage Membrane as required.

3.6.3 Reinforce Setting Bed with welded wire fabric as required.

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SECTION 09751 LIGHT-DUTY BRICK FLOORING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of light-duty brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Floor Brick (Brick Pavers): ASTM C 62, Grade SW, solid uncured brick, 1-1/4 inches thick by 3-1/4 inches by 8 inches.

2.2 Paving Brick: ASTM C 902, solid uncured brick of size selected by the Contracting Officer.

2.3 Masonry Mortar: ASTM C 270, Type M.

2.4 Portland Cement: ASTM C 150, Type I.

2.5 Aggregate for Masonry Mortar: ASTM C 144.

2.6 Hydrated Lime: ASTM C 207, Type S.

2.7 Aggregate for Cement Setting Beds: Sand as recommended in ASTM C 404.

2.8 Aggregate for Grout: Sand as recommended in ASTM C 404.

2.9 Pigments: Inert mineral oxides or carbon black.

2.10 Sand Setting Bed: ASTM C 33.

2.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives.

2.12 Cleavage Membrane: 15-pound asphalt felt or 4-mil polyethylene sheeting.

2.13 Setting Bed Reinforcement: 2-inch by 2-inch, 16/16, welded wire fabric, ASTM A 185.

3.0 EXECUTION:

3.1 General Requirements: Do not use brick with chips, cracks, voids, discolorations, and other defects. Cut brick shall have clean, sharp, unchipped edges. Use full units without cutting wherever possible. Set brick with uniform joints.

3.2 Ungrouted Applications: Place sand setting bed and compact by tamping. Set brick closely together, and sweep fine sand over surface to fill joint irregularities.

3.3 Portland Cement Applications:

3.3.1 Preparation of Subbase: Clean subbase to remove dirt, dust, debris, and loose particles.



3.3.2 Install Cleavage Membrane and provide folded membrane material at overlapping edges to form lock joints.

3.3.3 Apply Slush Coat of cement grout over surface of concrete subbase about 15 minutes prior to placing setting bed.

3.3.4 Setting Bed: Mix one bag of Portland cement to 3 cu. ft. of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of brick. Install reinforcing mesh if over a wood substrate.

3.3.5 Wet Brick several hours before laying. Do not lay bricks with free water on the surface.

3.3.6 Set Brick before initial set of cement bed occurs. Do not set brick on dry bed. Set and level each brick immediately.

3.3.7 Grout Joints as soon as possible after initial set of setting bed. Force grout into joints, strike flush, and tool slightly concave.

3.3.8 Use Portland Cement Grout mixed in the proportion of one bag of Portland cement to 2 cu. ft. of sand mixed with water to the consistency of heavy cream.

3.4 Masonry Mortar Applications:

3.4.1 Mix Mortar to comply with ASTM C 270 proportion specifications for Type "M" mortar.

3.4.2 Install Brick in bed joints of mortar with vertical joints filled with mortar. Remove excess mortar promptly as the work progresses.

3.4.3 Strike Joints flush with top surface of brick and tool slightly concave.

3.5 Pointing: During the tooling of joints, enlarge voids or holes and completely fill with mortar or grout.

3.6 Cleaning: Remove excess mortar/grout from exposed brick surfaces, wash, and scrub clean. Rinse with clean water.

3.7 Sealing and Waxing: After cleaning, apply a neutral sealer to brick flooring, and when dry, apply a suitable floor wax recommended for brick floors.

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SECTION 09791 STANDARD FLOOR TREATMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for standard floor treatments for terrazzo, ceramic tile, oxychloride, concrete, and resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cleaning Compound: A liquid chemical cleaner containing non-ionic and anionic type detergents, non-reactive to flooring. Compound shall have no free metal alkalies, no artificial coloring, and no fatty acids. Compound shall be UL listed as "slip-resistant."

2.2 Stripper: An ammoniated stripper that will penetrate and loosen wax films without damaging flooring. Stripper shall be non-flammable and phosphate-free with a flash point of none to boiling.

2.3 Wax: Water-emulsion type, self polishing, made from 100 percent No. 1 prime Carnauba wax, UL listed as "slip-resistant."

2.4 Polish: Metal cross-linked copolymer, slip-resistant polish. Polish shall dry to clear gloss without buffing.

2.5 Sealer: Penetrating type seal that will fill pores and leave a clear, hard, non-flaking, non-tracking finish. Sealer shall be UL listed as to slip resistance.

3.0 EXECUTION:

3.1 Preparation and Installation:

3.1.1 Terrazzo and Oxychloride Floors:

3.1.1.1 Clean floors with a neutral liquid cleaner with pH factor as near seven as possible.

3.1.1.2 Apply two coats of sealer, and buff with electric polishing machine.

3.1.2 Ceramic Tile Floors: Scrub thoroughly using a neutral liquid cleaner, and apply one coat of penetrating sealer.

3.1.3 Concrete Flooring:

3.1.3.1 Scrub thoroughly using a neutral liquid cleaner. Apply stripper to remove stubborn grease, waxes, and polishes.

3.1.3.2 When floor is clean and dry, apply two coats of penetrating sealer.

3.1.4 Resilient Flooring:

3.1.4.1 Scrub with a light solution of neutral chemical cleaner. Use a stripper to remove build-up of old wax and polishes. Rinse clean, and allow to dry.



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3.1.4.2 Apply two coats of wax and machine polish.

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SECTION 09792 FLOOR TREATMENT NON-SLIP COATINGS ON CONCRETE FLOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for non-slip coatings on concrete floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: A combination of pigmented two-part high solids urethane resin and a select gradation of sand shall be used. Color shall be selected from manufacturer's standard colors.

2.1 Tensile Strength and Elongation: Tensile strength shall be 580 psi, and elongation shall be 57 percent, all complying with ASTM D 412.

2.2 Water Absorption: Coatings shall not absorb water, in accordance with ASTM D 570.

2.3 Coefficient of Friction shall comply with ASTM D 1894.

2.4 Abrasion Resistance shall be ASTM D 1044 Taber Abraser, H-18 wheel, 1 kg load. Weight loss shall be 0.20 grams after 1,000 cycles.

2.5 Impact shall be by a 2-pound falling ball at 150 inch-pounds pressure, 0.05 inch maximum indentation with no cracking.

2.6 Chemical Resistance shall be non-staining to most common chemicals, such as 10 percent acetic acid, 10 percent citric acid, 10 percent sodium hydroxide, and ethyl alcohol.

3.0 EXECUTION: Concrete Floors shall be either acid etched or sand blasted. Surface to be coated shall be clean, dry, and free from surface contaminants.



Section 09793 Floor Treatment - Refinishing Wood Floors

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for refinishing wood floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cleaning Compound: A liquid chemical cleaner containing non-ionic and anionic type detergents, non-reactive to wood flooring. Compound shall have no free metal alkalies, no artificial coloring and no fatty acids. Compound shall be UL listed as "slip-resistant."

2.2 Varnish Remover: Non-flammable paint and varnish remover.

2.3 Stain: Penetrating type non-fading wood stain.

2.4 Wood Filler: Paste type wood filler, pigmented if necessary to match sample, complying with Fed. Spec. TT-F-336.

2.5 Floor Sealer: Penetrating type, pliable, wood-hardening finish/sealer.

2.6 Floor Varnish: Alkyd resin varnish, specially compounded for floor finish, Fed. Spec. TT-V-109.

2.7 Urethane Finish: Specially compounded for wood floor finish, moisture curing type, for multiple-coat application.

2.8 Floor Wax: Liquid, solvent-type, slip-resistant, CID A-A-1550, Type II.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Cleaning: Scrub thoroughly with cleaning compound and warm water. Rinse with clean water, mop dry, and buff with polishing machine.

3.1.2 Varnish Removal: Apply paint and varnish remover as required.

3.1.3 Sanding: Traverse floors two times with an electric-powered sanding machine. A rotary disc sander may be used for the final cut, but first cut shall be made with a drum-type machine. The first cut may be made crosswise of the grain or at a 45-degree angle. Make second cut in direction of grain. Use No. 1/2 sandpaper for first traverse and No. 0 for second traverse. Use an electric edger or hand sander for sanding areas near walls, in corners, and small closets.

3.2 Installation:

3.2.1 Apply Wood Paste Filler, followed by wiping cross-grain to work into pores and cracks.

3.2.2 Apply Stain if needed to match selected finish.

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3.2.3 Apply Sealer (2 coats) complying with Fed. Spec. TT-S-176. Use Class I for white oak and red oak floors and Class II for beech, birch, and hard maple floors.

3.2.4 Apply Floor Varnish, (3 coats) buffing after each coat. First coat may be thinned as a sealer.

3.2.5 Apply Urethane Finish. Apply as many coats as needed to build a dry film thickness of 1.0 mil.

3.2.6 When Floors are Dry, apply two coats of wax complying with Fed. Spec. P-W-155; concentration 12 percent. Spread the wax at the rate of 1,500 square feet per gallon and polish the floors with a weighted floor brush or an electric polisher.

3.2.7 Protection: Upon completion of work, cover all traffic areas immediately with nonstaining kraft paper or polyethylene, taped along edges, and maintain floor protection until acceptance.



SECTION 09910 EXTERIOR PAINTING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to exterior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Painting materials for the exterior surfaces indicated shall conform to the following Federal and Military Specifications:

2.1 Concrete:

TT-P-19 Paint, Acrylic Emulsion, Exterior

2.2 Concrete Masonry Units:

TT-F-1098 Filler, Block, Solvent-Thinned, for Porous Surface (Concrete Block, Cinder Block, Stucco, Etc.).

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-96 Paint, Latex Base, Exterior.

TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).

2.3 Stucco:

TT-F-1098 Filler, Block, Solvent- Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.).

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-96 Paint, Latex Base, Exterior.

TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).

2.4 Asbestos Cement:

TT-P-19 Paint, Acrylic Emulsion, Exterior

2.5 Wood, Unpainted:

TT-P-001984 Primer Coating, Latex Base, Exterior (Undercoat for Wood), White and Tints.

MIL-P-28582 Primer Coating, Exterior, Lead Pigment-Free (Undercoat for Wood, Ready-Mixed, White and Tints).

2.6 Wood, Primed:

TT-P-19 Paint, Acrylic Emulsion, Exterior.

TT-P-31 Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown.

TT-P-37 Paint, Alkyd Resin, Exterior Trim, Deep Colors.

TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints.

TT-P-1510 Paint, Latex, Exterior, for Wood Surfaces, White and Tints

2.7 Wood, Decks and Porches, Primed and Unpainted:

TT-E-487 Enamel: Floor and Deck.

2.8 Wood, to Receive Stain:

TT-S-708 Stain, Oil; Semi-Transparent, Wood, Exterior.

TT-S-001992 Stain, Latex, Exterior for Wood Surface.

2.9 Concrete Walls and Floors of Swimming Pools:

TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.

2.10 Ferrous Metals, Ungalvanized and Unpainted.

TT-P-86 Paint, Red-Lead-Base, Ready-Mixed.

TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type.

2.11 Ferrous Metals, Galvanized but Unpainted:

TT-P-641 Primer Coating: Zinc Dust-Zinc Oxide (for Galvanized Surfaces).

MIL-P-26915 Primer Coating, Zinc Dust Pigmented, for Steel Surfaces.

2.12 Ferrous Metals, Primed:

TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).

TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use).

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TT-P-31 Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown.

TT-P-37 Paint, Alkyd Resin, Exterior Trim, Deep Colors.

TT-P-38 Paint, Aluminum, Ready-Mixed.

TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints.

2.13 Aluminum or Aluminum Alloy, Unpainted:

TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type.

2.14 Aluminum or Aluminum Alloy, Primed:

TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).

TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use).

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete, Concrete Masonry Units and Stucco: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of iron, and other foreign matter. Apply a filler to areas of irregular surface profile.

3.1.2 Asbestos Cement: Remove stains with solvent. Do not wire brush.

3.1.3 Wood: Clean off foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails and prime and fill nail holes and other surface imperfections with putty, exterior spackling compound, or plastic wood filler. Allow to dry and sand smooth.

3.1.4 Ferrous Metals, Ungalvanized: If not shop-coated, solvent clean. Remove loose rust, mill scale, and other foreign matter by power wire brushing or sandblasting.

3.1.5 Ferrous Metals, Galvanized, and Aluminum and Aluminum Alloy: Solvent clean and treat with vinyl type wash coat conforming to Mil. Spec. DOD-P-15328.

3.2 Application: Provide complete hiding and uniform thickness of coats.

3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry units and allow to dry. Follow with finish coats.

3.2.2 Wood to Receive Paint: Prime bare wood prior to application of finish coats.

3.2.3 Ferrous Metals: Prime bare metal prior to application of finish coats.

3.2.4 Aluminum and Aluminum Alloy: Prime bare metal prior to application of finish coats.



SECTION 09915 COLOR SCHEDULE

BRAVURA COLOR SCHEDULE PALETTE #1

GENERAL

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

SD-14 Samples

Color board; GA

Three sets of color boards, 90 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.
- e. Color boards shall be submitted to the following addresses:

U.S. Army Health Facility Planning Agency Corporate Interior
Design Management Program
109 St. Joseph Street

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



Mobile, AL 36602

Attn: Kim Fortenberry, EN-DR

PRODUCTS

REFERENCE TO MANUFACTURER'S COLOR

Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

Exterior Walls – Not Applicable

Exterior Trim – Not Applicable

Exterior Roof – Not Applicable

Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

a. Carpet Tile:

- (CPT-1) Collins and Aikman "Madrigal" Remedies Series, Color #54216 Bravura, 100% DuPont Antron Lumena, 18" x 18", 27 oz. (Field Tile)
- (CPT-2) Collins and Aikman Plexus Accents, Color #81358 All Blues, (Accent Tile/border tile used for wayfinding)
- (CPT-3) Collins and Aikman Plexus Accents, Color #81363 Clarion, (Accent tile/border tile used for wayfinding)

b. Vinyl Composition Tile:

- (VT-1) Mannington vinyl composition tile, #131 Oyster White
12" x 12", 1/8" gauge (field tile)
- (VT-2) Mannington Essentials vinyl composition tile, #200 Navy
12" x 12", 1/8" gauge (accent tile)
- (VT-3) Mannington Essentials vinyl composition tile, #130 Wedgewood
12" x 12", 1/8" gauge (accent tile)
- (VT-4) Mannington Essentials vinyl composition tile, #218 Wineberry
12" x 12", 1/8" gauge (accent tile)

c. Ceramic Tile:

- (CT-1) American Olean #A13 White, 2" x 2" mosaic tile
- (CT-2) American Olean #A98 True Blue, 2" x 2" mosaic tile
- (CT-3) American Olean #R21 Midnight Blue, 2" x 2" mosaic tile



- d. Ceramic Tile Floor Grout:
(GRT-1) Southern Grout "Stormy Blue" #309

Marble Tile:

- (MT-1) Fritztile CL200 series marble tile, "White Rose",
#CL265, 12" x 12" tile

Seamless vinyl flooring:

- (SV-1) Armstrong Medintech #86476 "Ixia"
- (SV-2) Armstrong Medintech #86477 "Liatris"

Interior Base Finishes

Base materials shall be provided to match the colors listed below.

- a. Resilient Base and Edge/Transition Strips:
(RB-1) Allstate #28, 4"H vinyl base
- b. Ceramic Tile:
(CT-4) American Olean "Satinglo" #D11 Gardenia, 2" x 2"
- c. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout White, #101
- d. Seamless vinyl flooring:
(SV-1) Armstrong Medintech #86476 "Ixia"
- (SV-2) Armstrong Medintech #86477 "Liatris"

Interior Wall Finishes

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface. Wall materials shall be provided to match the colors listed below.

- a. Paint:
(P-1) ICI MP #30YY 71/073 Prism White (659)
(P-2) ICI MP #10BB 22/096 Shady Blue (1459) accent color
(P-3) ICI MP #90RR 10/119 Wild Cranberry (277) accent color
- b. Vinyl Wall Covering:
(VWC-1) Lanark #L2-CP-27 Chipstone "Nimbus"
(VWC-2) Lanark #YA2529 Oshima "Galaxy"
- c. Ceramic Tile:
(CT-4) American Olean "Satinglo" #D11 Gardenia 2" x 2" (field tile)
(CT-5) American Olean #Y73 Gloss Burgundy 2" x 2" (accent)
(CT-6) American Olean #Y70 Gloss Saxon Satinbrites 2" x 2" (accent)
(CT-7) American Olean #Y69, Gloss Navy 2" x 2" (accent)
- d. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout, #101 White

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



Interior Ceiling Finishes

Ceiling colors shall apply to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. Ceiling color shall also apply to joist, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Ceiling materials shall be provided to match the colors listed below.

Acoustical Tile and Grid:

(ATC-1) Armstrong #1910 Beveled Tegular Ultima acoustical ceiling tile, 24" x 24" x 5/8", white finish with 15/16" white T-grid

(ATC-2) Armstrong Ceramaguard ceiling, #601, 2' x 2' module, white finish with white T-grid

Paint:

(P-4) ICI MP #98YY 82/022 White High Hiding (2013) flat finish on gypsum board

Interior Trim

Interior trim shall be provided to match the colors listed below.

Doors:

(S-1) ICI Interior Wood stain, Provincial on Birch

Door Frames:

(P-1) ICI MP #30YY 71/073 Prism White (659), semi-gloss oil base enamel

c. Window Sills:

(SS-1) Corian Solid Surface Material, Champagne

d. Fire Extinguisher Cabinets: White

e. Wood Stain for miscellaneous wood items:

(S-1) ICI Interior Wood stain, Provincial on Birch

Interior Window Treatment

Window treatments shall be provided to match the colors listed below.

Horizontal Blinds:

(HB-1) Bali Aluminum Blinds #042 Matte White, 1" or 1/2" slats

Vertical Blinds:

(VB-1) Hunter Douglas flat PVC 3-1/2" vertical blinds, "Off White"



Interior Miscellaneous

Miscellaneous items shall be provided to match the colors listed below.

- a. Toilet Partitions and Urinal Screen:
Santana products, Hiny Hiders #020 Polymer HD White
OR
(PLAM-3) Nevamar #MR-6-5T Winter Grey Matrix
- b. Plastic Laminates
(PLAM-1) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-2) Nevamar #MR-1-8T Burgundy Matrix
(PLAM-3) Nevamar #MR-6-5T Winter Grey Matrix
- c. Lockers:
Republic Lockers , color #81 Alabaster
- d. Handrails/Corner Guards:
(HR-1) Acrovyn #875 Cordovan
(HR-2) Acrovyn #929 Oyster Gray
(CG-1) Acrovyn #929 Oyster Gray
- f. Wall Switch Handles and Standard Receptacle Bodies: White
- g. Electrical Device Cover Plates and Panels: White
- h. Fixed Casework:
(PLAM-1) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-2) Nevamar #MR-1-8T Burgundy Matrix
(PLAM-3) Nevamar #MR-6-5T Winter Grey Matrix
- i. Upholstered Cornice Board Fabric:
DesignTex "Lago Plus" #1901-903 Jewel

Cubicle Curtain Fabric:

Momentum Textiles Pattern No. 09402910, Hoopla, Color: Cheer

Solid Surface Material:

- (SS-1) Corian Solid Surface Material, Champagne
- (SS-2) Corian Sierra Family, Sunset

EXECUTION (Not Applicable)

OVERTURE COLOR SCHEDULE PALETTE #2

GENERAL

REFERENCES

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



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GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

SD-14 Samples

Color board; GA

Three sets of color boards, 90 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.
- e. Color boards shall be submitted to the following addresses:

U.S. Army Health Facility Planning Agency Corporate Interior
Design Management Program
109 St. Joseph Street
Mobile, AL 36602
Attn: Kim Fortenberry, EN-DR

PRODUCTS

REFERENCE TO MANUFACTURER'S COLOR



Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

Exterior Walls – Not Applicable

Exterior Trim – Not Applicable

Exterior Roof – Not Applicable

Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

a. Carpet Tile:

(CPT-1) Interface “Caribbean” carpet tile, Base style: #166070700, Base Color #3077
Trinidad, 6-1/2 ft. 67% DuPont Antron Lumena, 33% Dupont Antron Legacy, 24oz.
(field tile)

(CPT-2) Collins and Aikman Plexus Accents, Color #81353 Bluegrass,
(Accent Tile/border tile used for wayfinding)

(CPT-3) Collins and Aikman Plexus Accents, Color #81362 Rhapsody,
(Accent tile/border tile used for wayfinding)

b. Vinyl Composition Tile:

(VT-1) Mannington Essentials vinyl composition tile, #131 Oyster White, 12” x 12”, 1/8” gauge
(field tile)

(VT-2) Mannington Essentials vinyl composition tile, #200 Navy 12” x 12”, 1/8” gauge
(accent tile)

(VT-3) Mannington Essentials vinyl composition tile, #165 Teal 12” x 12”, 1/8” gauge
(accent tile)

(VT-4) Mannington Essentials vinyl composition tile, #244 New Egg Plant, 12” x 12”, 1/8”
gauge (accent tile)

c. Ceramic Tile:

(CT-1) Dal Tile #DK39 Danube 2” x 2” mosaic tile (keystone)

(CT-2) American Olean #R21 Midnight Blue, 2” x 2” mosaic tile (keystone)

(CT-3) American Olean #R09 Imperial Purple, 2” x 2” mosaic tile

d. Ceramic Tile Floor Grout:

(GRT-1) Southern Grout “Stormy Blue” #309

Marble Tile:

(MT-1) Fritztile CL200 series marble tile, “Twilight White”,
#CL215, 12” x 12” tile

Seamless Vinyl Flooring:

(SV-1) Armstrong Medintech #86488 “Dalia”

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Interior Base Finishes

Base materials shall be provided to match the colors listed below.

- a. Resilient Base and Edge/Transition Strips:
(RB-1) Armstrong #96 Forest Green, 4"H vinyl base
- b. Ceramic Tile:
(CT-4) American Olean "Satinglo" #D11 Gardenia, 2" x 2"
- c. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout, #101 White
- d. Seamless Vinyl Flooring:
(SV-1) Armstrong Medintech #86488 "Dalia"

Interior Wall Finishes

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface. Wall materials shall be provided to match the colors listed below.

- a. Paint:
(P-1) ICI MP #43YY 78/053 Antique White (659)
(P-2) ICI MP #90GG 12/168 Nassau Night (1459) accent color
(P-3) ICI MP #10RB 47/036 Cosmic Sea (277) accent color
- b. Vinyl Wall Covering:
(VWC-1) Lanark #L2-CB-12 Cobble "Gull"
(VWC-2) Lanark #L2-KY-17 Kyosi "Bluestone"
- c. Ceramic Tile:
(CT-4) Dal-Tile #6572 Teal 2" x 2" (accent)
(CT-5) American Olean #D09 Imperial Purple, 2" x 2" (accent)
(CT-6) American Olean #Y69 Gloss Navy, 2" x 2" (accent)
(CT-7) American Olean "Satinglo" #D11 Gardenia 2" x 2" (field tile)
- d. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout, #101 White

Interior Ceiling Finishes

Ceiling colors shall apply to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. Ceiling color shall also apply to joist, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Ceiling materials shall be provided to match the colors listed below.



Acoustical Tile and Grid:

(ATC-1) Armstrong #1910 Beveled Tegular Ultima acoustical ceiling tile, 24" x 24" x 5/8", white finish with 15/16" white T-grid

(ATC-2) Armstrong Ceramaguard ceiling, #601, 2' x 2' module, white finish with white T-grid

Paint:

(P-4) ICI MP #98YY 82/022 White High Hiding (2013) flat finish on gypsum board

Interior Trim

Interior trim shall be provided to match the colors listed below.

Doors:

(S-1) ICI Interior Wood stain, Early American on Birch

Door Frames:

(P-1) ICI MP #43YY 78/053 Antique White (659), semi-gloss oil base enamel

c. Window Sills:

(SS-1) Corian Solid Surface Material, Champagne

d. Fire Extinguisher Cabinets: White

e. Wood Stain for miscellaneous wood items:

(S-1) ICI Interior Wood stain, Early American on Birch

Interior Window Treatment

Window treatments shall be provided to match the colors listed below.

Horizontal Blinds:

(HB-1) Bali Aluminum Blinds #042 Matte White, 1" or 1/2" slats

b. Vertical Blinds:

(VB-1) Hunter Douglas 3-1/2" flat PVC vertical blinds "Off White"

Interior Miscellaneous

Miscellaneous items shall be provided to match the colors listed below.

a. Toilet Partitions and Urinal Screen:

Job Order Contract Specifications

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Santana products, Hiny Hiders #020 Polymar HD
Or
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

b. Plastic Laminates

(PLAM-1) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-2) Nevamar #MR-1-5T Orchid Mist Matrix
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

c. Lockers:

Republic Lockers , color #81 Alabaster

d. Handrails/Corner Guards:

(HR-1) Acrovyn #942 Nile

(HR-2) Acrovyn #262 Driftwood

(CG-1) Acrovyn #262 Driftwood

f. Wall Switch Handles and Standard Receptacle Bodies: White

g. Electrical Device Cover Plates and Panels: White

h. Fixed Casework:

(PLAM-1) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-2) Nevamar #MR-1-5T Orchid Mist Matrix
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

i. Cubicle Curtain Fabric:

Momentum Textiles, Pattern No. 09131620 "Ballyhoo", Color: Cheer

Upholstered Cornice Boards:

Maharam "Splendor" #404401, Color: 006 Jewel

Solid Surface Material:

(SS-1) Corian Solid Surface Material, Natural Pearl
(SS-2) Corian Sierra family, Aqua

EXECUTION (Not Applicable)

CONCERTO COLOR SCHEDULE PALETTE #3

GENERAL

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

GENERAL



This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

SD-14 Samples

Color board; GA

Three sets of color boards, 90 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.
- e. Color boards shall be submitted to the following addresses:
U.S. Army Health Facility Planning Agency Corporate Interior
Design Management Program
109 St. Joseph Street
Mobile, AL 36602
Attn: Kim Fortenberry, EN-DR

PRODUCTS

REFERENCE TO MANUFACTURER'S COLOR

Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

Exterior Walls – Not Applicable

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Exterior Trim – Not Applicable

Exterior Roof – Not Applicable

Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

a. Carpet Tile:

- (CPT-1) Collins and Aikman "Madrigal" Remedies Series, Color #542143 Concerto, 100% DuPont Antron Lumena, 18"x18", 27oz. (Field Tile)
- (CPT-2) Collins and Aikman Plexus Accents, Color #81353 Bluegrass, (Accent Tile/border tile used for wayfinding)
- (CPT-3) Collins and Aikman Plexus Accents, Color #81356 Cantor, (Accent tile/border tile used for wayfinding)

b. Vinyl Composition Tile:

- (VT-1) Mannington vinyl composition tile, #131 Oyster White, 12" x 12", 1/8" gauge (field tile)
- (VT-2) Mannington Essentials vinyl composition tile, #215 Aegean 12" x 12", 1/8" gauge (accent tile)
- (VT-3) Mannington Essentials vinyl composition tile, #155 Spruce 12" x 12", 1/8" gauge (accent tile)
- (VT-4) Mannington Essentials vinyl composition tile, #116 Adobe, 12" x 12", 1/8" gauge (accent tile)

c. Ceramic Tile:

- (CT-1) American Olean #A76 Dusty Rose, 2" x 2" mosaic tile
- (CT-2) American Olean #A05 Light Aspen, 2" x 2" mosaic tile
- (CT-3) American Olean #A02 Dark Aspen, 2" x 2" mosaic tile

d. Ceramic Tile Floor Grout:

- (GRT-1) Southern Grout "Aqua Blue" #328

Marble Tile:

- (MT-1) Fritztile CL200 series marble tile, "Aztec White", #CL210, 12" x 12" tile

Seamless Vinyl Flooring:

- (SV-1) Armstrong Medintech #86472 "Bouvardia"

Interior Base Finishes

Base materials shall be provided to match the colors listed below.

a. Resilient Base and Edge/Transition Strips:

- (RB-1) Armstrong #96 Forest Green, 4"H vinyl base

b. Ceramic Tile:



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(CT-4) American Olean "Satinglo" #D07 Satin Linen, 2" x 2"

c. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout, #101 White

d. Seamless Vinyl Flooring:
(SV-1) Armstrong Medintech #86472 "Bouvardia"

Interior Wall Finishes

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface. Wall materials shall be provided to match the colors listed below.

a. Paint:
(P-1) ICI MP #20YY 74/055 Woodwind (659)
(P-2) ICI MP #60YR 39/154 Coral Sand (1459) accent color
(P-3) ICI MP #90GG 12/168 Nassau Night (277) accent color

b. Vinyl Wall Covering:
(VWC-1) Vin L Fab Vesuvio #A24-660 "Aleutia"
(VWC-2) Lanark #L2-KY-11 Kyosi "Seaglass"

c. Ceramic Tile:
(CT-4) American Olean "Satinglo" #D07 Satin Linen 2" x 2" (field tile)
(CT-5) [Discontinue](#)
(CT-6) American Olean #D05 Satin Light Aspen, 2" x 2" (accent)
(CT-7) American Olean #D44 Emerald, 2" x 2" (accent)

d. Ceramic Tile Wall Grout:
(GRT-2) Southern Grout, #101 White

Interior Ceiling Finishes

Ceiling colors shall apply to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. Ceiling color shall also apply to joist, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Ceiling materials shall be provided to match the colors listed below.

Acoustical Tile and Grid:
(ATC-1) Armstrong #1910 Beveled Tegular Ultima acoustical ceiling tile, 24" x 24" x 5/8", white finish with 15/16" white T-grid
(ATC-2) Armstrong Ceramaguard ceiling, #601, 2' x 2' module, white finish with white T-grid

Paint:
(P-4) ICI MP #98YY 82/022 White High Hiding (2013)

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Interior Trim

Interior trim shall be provided to match the colors listed below.

Doors:

- (S-1) ICI Interior Wood stain, Provincial on Birch

Door Frames:

- (P-1) ICI MP #20YY 74/055 Woodwind (659), semi-gloss oil base enamel

c. Window Sills:

- (SS-1) Corian Solid Surface Material, "Bone"

d. Fire Extinguisher Cabinets: White

e. Wood Stain for miscellaneous wood items:

- (S-1) ICI Interior Wood stain, Provincial on Birch

Interior Window Treatment

Window treatments shall be provided to match the colors listed below.

Horizontal Blinds:

- (HB-1) Bali Aluminum Blinds #042 Matte White, 1" or ½" slats

b. Vertical Blinds:

- (VB-1) Hunter Douglas 3-1/2" flat PVC vertical blinds, "Off White"

Interior Miscellaneous

Miscellaneous items shall be provided to match the colors listed below.

a. Toilet Partitions and Urinal Screen:

Santana products Hidy Hider #020 Polymar HD White

OR

(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

b. Plastic Laminates

(PLAM-1) Nevamar #FS-1-1T Desert Landscape

(PLAM-2) Nevamar #FS-5-1T Alpine Fissure

(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

c. Lockers:

Republic Lockers , color #81 Alabaster

d. Handrails/Corner Guards:



(HR-1) Acrovyn #946 Victorian Teal
(HR-2) Acrovyn #198 Beige Desert
(CG-1) Acrovyn #198 Beige Desert

f. Wall Switch Handles and Standard Receptacle Bodies: White

g. Electrical Device Cover Plates and Panels: White

h. Fixed Casework:

(PLAM-1) Nevamar #FS-1-1T Desert Landscape

(PLAM-2) Nevamar #FS-5-1T Alpine Fissure

(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

i. Upholstered Cornice Board Fabric:

Designtex "Tarzan Plus" #1902-402

Cubicle Curtain Fabric:

Coral of Chicago "Singleleaf", Color: Desert-Mist, 100% Avora

k. Solid Surface Material:

(SS-1) Corian Solid Surface Material, "Bone"

(SS-2) Corian Summit Family, "Pyrenes"

EXECUTION (Not Applicable)

SECONDO COLOR SCHEDULE PALETTE #4

GENERAL

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only.

SD-14 Samples

Color board; GA

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Three sets of color boards, 90 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.
- e. Color boards shall be submitted to the following addresses:

U.S. Army Health Facility Planning Agency Corporate Interior Design
Management Program
109 St. Joseph Street
Mobile, AL 36602
Attn: Kim Fortenberry, EN-DR

PRODUCTS

REFERENCE TO MANUFACTURER'S COLOR

Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

Exterior Walls – Not Applicable

Exterior Trim – Not Applicable

Exterior Roof – Not Applicable

Interior Floor Finishes

Flooring materials shall be provided to match the colors listed below.

- a. Carpet Tile:

(CPT-1) Collins and Aikman "Madrigal" Remedies Series, Color #54223
Secondo, 100% DuPont Antron Lumena, 18" x 18", 27 oz.
(Field Tile)



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(CPT-2) Collins and Aikman Plexus Accents, Color #81356 Cantor,
(Accent Tile/border tile used for wayfinding)

(CPT-3) Collins and Aikman Plexus Accents, Color #81358 All
Blues, (Accent tile/border tile used for wayfinding)

b. Vinyl Composition Tile:

(VT-1) Mannington Essentials vinyl composition tile, #131 Oyster White, 12" x 12", 1/8" gauge
(field tile)

(VT-2) Mannington Essentials vinyl composition tile, #158 Redwood
12" x 12", 1/8" gauge (accent tile)

(VT-3) Mannington Essentials vinyl composition tile, #116 Adobe
12" x 12", 1/8" gauge (accent tile)

(VT-4) Mannington Essentials vinyl composition tile, #200 Navy
12" x 12", 1/8" gauge (accent tile)

c. Ceramic Tile:

(CT-1) **Discontinued**

(CT-2) American Olean #A76 Dusty Rose 2" x 2" mosaic tile

(CT-3) American Olean #A93 Saxon Blue, 2" x 2" mosaic tile

d. Ceramic Tile Floor Grout:

(GRT-1) Bostik Hydroment Grout, Smokewood S11/U610

Marble Tile:

(MT-1) Fritztile CL200 series marble tile, "Twilight White",
#CL215, 12" x 12" tile

Seamless Vinyl Flooring:

(SV-1) Armstrong Medintech #86486 "Campanula Buff"

Interior Base Finishes

Base materials shall be provided to match the colors listed below.

a. Resilient Base and Edge/Transition Strips:

(RB-1) Johnsonite #DC-56 Shrimp Bisque, 4"H vinyl base

b. Ceramic Tile:

(CT-4) American Olean "Satinglo" #D11 Gardenia, 2" x 2"

c. Ceramic Tile Wall Grout:

(GRT-2) Southern Grout, #101 White

Seamless Vinyl Flooring (coved base)

(SV-1) Armstrong Medintech #86386 "Campanula Buff"

Interior Wall Finishes

Interior wall color shall apply to the entire wall surface, including reveals, vertical furred spaces, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise

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specified. Items not specified in other paragraphs shall be painted to match adjacent wall surface. Wall materials shall be provided to match the colors listed below.

a. Paint:

(P-1) ICI MP #30YY 71/073 Prism White (659)

(P-2) ICI MP #10BB 11/126 America's Cup (1459) accent color

(P-3) ICI MP #60YR 39/154 Coral Sand (277) accent color

b. Vinyl Wall Covering:

(VWC-1) Lanark #L2-KY-04 Kyosi "Beige"

(VWC-2) Lanark #L2-CP-03 "Ecru"

c. Ceramic Tile:

(CT-4) American Olean "Satinglo" #D11 Gardenia 2" x 2" (field tile)

(CT-5) American Olean "Satin Designer" #D29 Dusty Rose 2" x 2"
(accent)

(CT-6) American Olean #D22 True Blue, 2" x 2" (accent)

(CT-7) American Olean #D21 Cobalt, 2" x 2" (accent)

d. Ceramic Tile Wall Grout:

(GRT-2) Southern Grout, #101 White

Interior Ceiling Finishes

Ceiling colors shall apply to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. Ceiling color shall also apply to joist, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Ceiling materials shall be provided to match the colors listed below.

Acoustical Tile and Grid:

(ATC-1) Armstrong #1911 Beveled Tegular Ultima acoustical ceiling
tile, 24" x 24" x 5/8", white finish with white 15/16" T-grid

(ATC-2) Armstrong Ceramaguard #601 ceiling, 2' x 2' module, white finish
with white T-grid

Paint:

(P-4) ICI MP #98YY 82/022 White High (2013) flat finish on gypsum board

Interior Trim

Interior trim shall be provided to match the colors listed below.

Doors:

(S-1) ICI Interior Wood stain, Provincial on Birch

Door Frames:

(P-1) ICI MP #30YY 71/073 Prism White (659), semi-gloss oil base enamel



- c. Window Sills:
(SS-1) Corian Solid Surface Material, "Bone"
- d. Fire Extinguisher Cabinets: White
- e. Wood Stain for miscellaneous wood items:
(S-1) ICI Interior Wood stain, Provincial on Birch

.9 Interior Miscellaneous

Window treatments shall be provided to match the colors listed below:

Horizontal Blinds:

(HB-1) Bali Aluminum Blinds #042 Matte White, 1" or 1/2" slats

Vertical Blinds:

(VB-1) Hunter Douglas 3-1/2" flat PVC vertical blinds "Off White"

.10 Interior Miscellaneous

Miscellaneous items shall be provided to match the colors listed below.

- a. Toilet Partitions and Urinal Screen:
Santana products Hidy Hiders #020 Polymar HD White
or
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix
- b. Plastic Laminates
(PLAM-1) Nevamar #MR-1-2T Rose Matrix Textured
(PLAM-2) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix
- c. Lockers:
Republic Lockers , color #81 Alabaster
- d. Handrails/Corner Guards:
(HR-1) Acrovyn # 196 Fawn,

(HR-2) Acrovyn #957 Bluestone

(CG-1) Acrovyn # 196 Fawn
- f. Wall Switch Handles and Standard Receptacle Bodies: White
- g. Electrical Device Cover Plates and Panels: White
- h. Fixed Casework:
(PLAM-1) Nevamar #MR-1-2T Rose Matrix Textured
(PLAM-2) Nevamar #MR-3-5T Navy Matrix Textured
(PLAM-3) Nevamar #MR-7-2T Wild Oats Matrix

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Cubicle Curtain:

Designtex "Shangri-La Safe, #8076-901

Upholstered Cornice Boards:

MAHARAM "Indian Summer", #006 Nocturne Blue

Solid Surface Material:

(SS-1) Corian Solid Surface Material, "Bone"

(SS-2) Corian Sierra Collection, "Oceanic"

EXECUTION (Not Applicable)

--End of Section--



SECTION 09920 INTERIOR PAINTING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to interior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Painting materials for the interior surfaces indicated shall conform to the following Federal and Military Specifications.

2.1 Concrete:

2.1.1 Walls and Nontextured Ceilings:

- TT-E-508 Enamel, Interior, Semigloss, Tints and White.
- TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
- TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).
- TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints.
- TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
- TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.
- TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

2.1.2 Textured Ceilings:

- TT-C-555 Coating, Textured (for Interior and Exterior Masonry Surfaces).

2.1.3 Floors:

- TT-P-91 Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors).

2.2 Concrete Masonry Units:

TT-C-535 Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry.

- TT-C-542 Coating, Polyurethane, Oil-Free, Moisture Curing.
- TT-C-550 Coating System Glaze, High Performance, (Solvent Base) for Interior Surfaces.
- TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
- TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
- TT-E-508 Enamel, Interior, Semigloss, Tints and White.

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TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-545	Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).
TT-F-1098	Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.).
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-95	Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

2.3 Asbestos Cement:

TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-545	Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-1511	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

2.4 Gypsum Wallboard and Plaster:

TT-C-535	Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry.
TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing.
TT-C-550	Coating System Glaze, High Performance, (Solvent Base) for Interior Surfaces.
TT-E-505	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-545	Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).
TT-P-29	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.



TT-P-650 Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard).

TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

TT-S-179 Sealer Surface: Pigmented Oil for Plaster and Wallboard.

2.5 Wood Other Than Floors:

2.5.1 Painted Surfaces:

TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.

TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use).

TT-E-508 Enamel, Interior, Semigloss, Tints and White.

TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.

TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).

TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints.

TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).

2.5.2 Stained, Varnished, or Natural Finishes Surfaces:

TT-S-176 Sealer, Surface, Varnish Type, Floor, Wood and Cork.

TT-S-711 Stain; Oil Type, Wood, Interior.

TT-V-85 Varnish, Oil, Low Sheen, Brush or Spray Application.

TT-V-109 Varnish, Spar, Alkyd-Resin.

TT-V-119 Varnish, Spar, Phenolic-Resin.

TT-V-121 Varnish, Spar, Water-Resisting.

2.5.3 Furniture:

TT-S-711 Stain; Oil Type, Wood, Interior.

TT-V-86 Varnish, Oil, Rubbing (for Metal and Wood Furniture).

2.6 Wood Floors:

2.6.1 Painted Surfaces:

TT-E-487 Enamel: Floor and Deck.

2.6.2 Stained or Natural Finished Surfaces:

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P-W-155	Wax, Floor, Water-Emulsion.
P-W-158	Wax, General Purpose, Solvent Type.
TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing.
TT-S-176	Sealer, Surface, Varnish Type, Floor, Wood and Cork.

2.7 Ferrous Metals:

2.7.1 Ungalvanized and Unpainted:

TT-P-86	Paint, Red-Lead-Base, Ready-Mixed.
TT-P-615	Primer Coating: Basic Lead Silico Chromate, Ready Mixed.
TT-P-645	Primer, Paint, Zinc-Chromate, Alkyd Type.
TT-V-51	Varnish: Asphalt.

2.7.2 Galvanized but Unpainted:

DOD-P-15328 Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric).

2.7.3 Primed:

TT-E-489	Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).
TT-E-505	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508	Enamel, Interior, Semigloss, Tints and White.
TT-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-545	Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White).
TT-P-30	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-38	Paint, Aluminum, Ready-Mixed.

2.8 Fire Retardant Paint:

2.8.1 Non-Metallic Surfaces:

TT-P-26	Paint, Interior, White, Tints and Black, Fire Retardant.
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2.8.2 Metallic Surfaces:

TT-P-001932	Paint, Latex Base, Interior, White, Tints and Black, Fire Retardant.
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3.0 EXECUTION:



3.1 Preparation:

3.1.1 Concrete and Concrete Masonry Units: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, and surface deposits of iron and other foreign matter.

3.1.2 Asbestos Cement: Remove stains with solvent. Do not wire-brush.

3.1.3 Gypsum Wallboard: Remove dirt and dust prior to application of first coat.

3.1.4 Plaster: Age at least 30 days. Clean, remove loose matter, and repair surface irregularities. Instrument-measured moisture content shall not exceed 8 percent.

3.1.5 Wood: Remove foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails, and prime and fill nail holes and other surface imperfections with putty or plastic wood filler. Allow to dry and sand smooth.

3.1.6 Ferrous Metals, Ungalvanized: If not shop-coated, clean with solvent. Remove loose rust, mill scale, and other foreign matter by proper wire brushing or sand blasting.

3.1.7 Ferrous Metals, Galvanized: Clean with solvent.

3.2 Application: Provide complete hiding and uniform thickness of coats.

3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry unit surfaces where required and allow to dry. Follow with finish coats.

3.2.2 Gypsum Wallboard and Plaster: Touch up suction spots or overall application of base coat or sealer to produce a uniform color or gloss prior to application of finish coats.

3.2.3 Wood to Receive Stain: Sand lightly after application of stain. On open-grain wood surfaces, apply wood filler after staining as required. Sand smooth. Sand lightly between coats of varnish.

3.2.4 Ferrous Metals: Prime bare metal prior to application of finish coats.



SECTION 09941 PAINTING OF WATER STORAGE TANK INTERIOR SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank interior surfaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Mil. Spec. DOD-P-15328, SSPC Paint 8, and Mil. Spec. MIL-P-15930.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.1.2 Forced Ventilation: Whenever surface preparation or painting operations include the use of volatile organic solvents, the enclosed space shall be made safe at all times from fire and explosion as determined by a calibrated explosimeter or organic vapor analyzer. During the painting operation, sufficient exhaust ventilation shall be provided to exchange the air in the enclosed spaces with fresh air at the rate of 5,000 cfm for each spray gun in operation. All parts of the enclosed spaces shall be swept by moving air. Exhaust ducts shall discharge clear of working areas and away from sources of possible ignition. If the ventilation fails, operations shall be stopped and the compartment evacuated until sufficient exhaust ventilation is provided.

3.1.3 Blast Cleaning: Ferrous surfaces shall be dry blast cleaned to near white metal grade, which shall be in compliance with SSPC-SP 5, except that paragraphs 3.1, 3.2, 3.3, and 3.10 shall not be applicable and except that a limited relaxation from the uniform white metal grade of surface cleanliness will be permitted, as follows. The metal shall be cleaned to such a degree that were a large surface to be divided into 6-inch squares, at least 75 percent of the subdivisions would meet the white metal grade of cleanliness and the remaining subdivisions would be randomly distributed. Within these small, randomly distributed areas a minor relaxation from white metal cleanliness would be permitted, consisting only of very slight shadows, stains, and discolorations stemming from very thin, adherent, sparsely scattered residues of mill scale and corrosion products. No relaxation from the white metal grade will be permitted on surface irregularities such as edges, interior angles, welds, rivet lines, and junctions of joining members. The overall blasting effort expended shall be not less than two-thirds (2/3) of that which would be required to accomplish the white metal grade of cleanliness on the specific surfaces involved, but this limitation shall not be construed as a waiver of any of the requirements above. Remove weld spatter not dislodged by blasting with impact or grinding tools. Surfaces shall be dry at the time of blasting.

3.1.4 Surface Protection: Within 8 hours after cleaning but in any event prior to the deposition or formation of any detectable moisture, contaminants, or corrosion, all ferrous surfaces that have been blast cleaned to the near-white metal grade shall be cleaned of dust and abrasive particles by brushing, vacuum cleaning, and/or blowdown with clean, dry compressed air, and shall be given the pretreatment and first coat of paint.



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3.1.5 Pretreatment: All sandblasted surfaces shall receive a washcoat pretreatment complying with Mil. Spec. DOD-P-15328. Application shall be by spray, and all requirements of the specification concerning mixing, thinning, application, and spreading rate shall be followed. All materials not applied within a maximum of eight hours after mixing shall be discarded and must not be used.

3.2 Installation:

3.2.1 Primer Paint: All pretreated surfaces shall receive two coats of vinyl paint complying with Mil. Spec. MIL-P-15930. Application shall be by brush or spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding primer coat (or initial finish coat) shall not be applied until the primer is dry to touch. The color of alternate coats shall provide contrast to assist in obtaining complete coverage.

3.2.2 Finish Paint: All primed surfaces shall receive a minimum of two coats of Aluminum Vinyl Finish Paint complying with SSPC Paint 8. The paint shall be formulated as specified except that high boiling solvents such as cyclohexanone shall not be used in the formulation. High boiling solvents may be substituted for the ketones specified in the thinner only if ambient temperatures at the time of application exceed 75 F (24 C). Application shall be by spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding coat shall not be applied until the first coat is dry to touch.

3.2.3 Thickness Requirements: Apply the washcoat pretreatment to a dry film thickness of at least 0.3 mils but not exceeding 0.5 mils. Apply the primer paint to produce a dry film of approximately 2.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement at no additional cost to the Government. Final thickness measurements shall be made by the Contractor in the presence of the Contracting Officer using a magnetic thickness gauge as specified in SSPC-PA 2.

3.2.4 Final Drying Time: After the final coat of paint has been applied, the tank shall remain open and forced ventilation shall be continued for a minimum of three days prior to being flooded with water.

3.2.5 Washing: After the final work has been completed in the tank, but prior to any disinfecting operations, wash the tank with clean water to remove all dust and overspray. Washing may take place during the final dry time provided the coating is sufficiently cured to withstand the abuse.

3.2.6 Disinfection of Tank: After painting and all other interior work has been completed, disinfect the tank before it is replaced in service. If the local medical facility or health department requires a specific procedure for disinfection, follow that procedure. Otherwise the following procedure shall be followed: Place water containing 50 ppm chlorine in the tank to such a depth that when the tank is filled the resultant chlorine concentration shall be no less than 2 ppm. Hold the water containing 50 ppm chlorine in the tank for 24 hours before the tank is filled. Allow the full tank, in turn, to stand for 24 hours, after which the tank may be put into service without draining the water used to disinfect it.



SECTION 09942 PAINTING OF WATER STORAGE TANK EXTERIOR SURFACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank exterior surfaces. Product shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Fed. Spec. TT-P-86, TT-P-320, TT-V-81, and SSPC Paint 101.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 All Exterior Surfaces to be Painted shall be cleaned using power tools in compliance with SSPC-SP 3 or, at the option of the Contractor, surfaces may be blast cleaned in compliance with SSPC-SP 7. In addition, the following operations shall be implemented.

3.1.2 Mildew shall be removed from all surfaces to be painted by scrubbing the surface with a solution consisting of 1/2 pound of trisodium phosphate and 1 pound of hypochlorite bleach per gallon of warm water. Additional bleach may be beneficial in heavily mildewed areas. Rinse surfaces to remove cleaning materials and allow to dry completely before repainting.

3.1.3 Surface Glaze remaining on existing coatings shall be removed either by lightly abrading the surface or through the use of a chemical deglosser.

3.1.4 Removal of Vines and Trimming of Plantings: Remove all ivy vines and tentacles interfering with the contract work from the exteriors of the structure and haul from the site of the work. Remove ivy in such a fashion that the remaining growth shall all be live and connected to the root system. Other types of plantings that interfere with the contract surfaces shall be trimmed or tied back.

3.2 Installation:

3.2.1 All Paints shall be mixed, thinned, and applied in compliance with the procedures and requirements set forth in SSPC-PA 1. The following paint system shall be used.

3.2.2 Primer: The primer shall consist of one coat of a material complying with Fed. Spec. TT-P-86, Type II.

3.2.3 Finish Coats: The finish coats shall consist of a minimum of two coats of one of the following paints: Paint 1 - job-mixed alkyd aluminum paint in compliance with SSPC Paint 101 Type I or Paint 2 - aluminum paint consisting of aluminum paste and a mixing varnish in compliance with Fed. Spec. TT-V-81, Type II and mixed in the proportions of two pounds of aluminum paste complying with Fed. Spec. TT-P-320 per gallon of mixing varnish.

3.2.4 Thickness Requirements: Apply the primer paint to a dry film thickness of approximately 1.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 3.5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement. Final thickness measurements shall be made by the Contractor in the presence of the Contracting Officer, using a magnetic thickness gauge as specified in SSPC-PA 2.



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3.2.5 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.2.6 Lettering and Sign Painting: Building number signs, gauges, and other signs that are painted shall have lettering and numbering repainted. Design and color shall match existing.

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SECTION 09970 WALL COVERINGS

PART

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84 (1991a) Surface Burning Characteristics of Building Materials

FEDERAL SPECIFICATIONS (FS)

FS CCC-W-408 (Rev D) Wall Covering, Vinyl-Coated

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Wall Covering and Accessories; FIO

Manufacturer's descriptive data.

SD-06 Instructions

Installation; FIO

Installation instructions for wall covering and accessories.

Maintenance; FIO

Cleaning and maintenance instructions for wall covering and accessories.

SD-14 Samples

Wall Covering and Accessories; GA

Three samples of each indicated type, pattern, and color of wall covering required. Samples of wall covering shall be minimum 6" x 6" and of sufficient size to show pattern repeat.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers. Materials shall be stored in accordance with the manufacturer's instructions in a clean dry area with temperature maintained above 16 degrees C.



1.4 ENVIRONMENTAL REQUIREMENTS

Areas to receive wall covering shall be maintained at a temperature above 16 degrees C for 3 days before, during, and 3 days after application.

1.5 EXTRA MATERIALS

One lineal foot of full-width wall covering for each 100 linear yds. of wall covering installed shall be furnished. The wall covering shall be from the same lot as that installed.

PART 2 PRODUCTS

2.1 WALL COVERINGS

Wall coverings shall be manufacturer's standard material designed specifically for the specified use. Wallcoverings to have Class A interior finish for all areas when tested in accordance with ASTM E 84.

2.1.1 Vinyl Wall Covering

Vinyl wall covering shall be a vinyl coated woven or non-woven fabric with mildew and germicidal additives and shall conform to FS CCC-W-408, Type II, medium-duty(15-24 oz.) Per square yard and a width of 48" minimum. Pattern and color of vinyl wall covering shall be as indicated in Section 09915 COLOR SCHEDULE.

2.1.2 Acoustical Wall Covering

Acoustical wall covering shall be polypropylene, vinyl coated fabric with needle punched surface with fused back. Acoustical wallcovering shall have a Class A flame spread rating of 0-25 and smoke development rating of 0-50 when tested in accordance with ASTM E 84. Pattern and color of acoustical wallcovering shall be as indicated in Section 09915 COLOR SCHEDULE. Acoustical wallcovering shall meet or exceed the following:

Total Weight: 20 oz. Per square yd.

Width: 48 inches minimum

c. NRC rating in accordance with ASTM E 423: Minimum NRC .55

2.2 EDGE GUARDS

Edge guards shall be 3/32 inch thick and shall cover ¾ inch each side of corner at right angles. Edge guards shall be clear vinyl from the same lot and color.

2.3 PRIMER AND ADHESIVE

Primer and adhesive shall be mildew resistant and of a type recommended by the wall covering manufacturer.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

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Wall covering shall not be applied to surfaces that are rough, that contain stains that will bleed through the wall covering, or that are otherwise unsuitable for proper installation. Cracks and holes shall be filled and rough spots shall be sanded smooth. Surfaces to receive wall covering shall be thoroughly dry. Plaster surfaces shall age at least 30 days prior to installation of vinyl wall coverings. Moisture content of plaster, concrete, and masonry shall be tested with an electric moisture meter and reading shall be not more than 5 percent. Masonry walls shall have flush joints. Concrete and masonry walls shall be coated with a thin coat of joint compound or cement plaster as a substrate preparation. Surface of walls shall be primed as required by manufacturer's instructions to permit ultimate removal of wall covering from the wall surface. Primer shall be allowed to completely dry before adhesive application.

3.2 INSTALLATION

3.2.1 Vinyl and Acoustical Wall Covering

Wall covering shall be installed in accordance with the manufacturer's installation instructions. Glue and adhesive spillage shall be immediately removed from wall covering face and seams with a remover recommended by the manufacturer.

3.2.2 Edge Guards

Edge guards shall be installed on all outside corners where vinyl wallcovering is located and in accordance with the manufacturer's printed instructions. Edge guards shall run from top of base to ceiling in a continuous length.

3.3 CLEAN-UP

Upon completion of the work, wall covering shall be left clean and free of dirt or soiling.

--END OF SECTION--



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DIVISION 10 SPECIALTIES



SECTION 10160 COMPARTMENTS AND CUBICLES FOR SHOWER AND TOILET ROOMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated plastic and metal toilet partitions, urinal screens, and shower and dressing compartments. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Laminated Plastic Toilet Partitions and Urinal Screens:

2.1.1 Plastic Laminate shall be NEMA LD-3, minimum 0.062 inch thick.

2.1.2 Core Material for Plastic Laminate shall be manufacturer's standard particleboard or plywood, in thickness to provide a nominal dimension of 1 inch for doors, panels, and screens and 1-1/4 inches for pilasters.

2.1.3 Pilaster Shoes shall be ASTM A 167, Type 302 or 304, stainless steel not less than 3 inches high, 20 gauge, finished to match hardware.

2.1.4 Stirrup Brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.

2.1.5 Hardware and Accessories shall be manufacturer's standard design heavy duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium plated brass, as required.

2.1.6 Overhead Bracing shall be continuous extruded aluminum tubing in antigrip profile, with clear anodized finish.

2.1.7 Anchorages and Fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.1.8 Fabrication:

2.1.8.1 General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system. Furnish units with cutouts, 10155-drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars.

2.1.8.2 One-Piece Face Sheets shall be pressure-laminated to core material with no splices or joints, and with edges straight and sealed. Seal exposed core material at cutouts to protect against moisture.

2.1.8.3 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.



2.1.8.4 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

2.1.8.5 Ceiling-Hung Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit connection to structural support above finished ceiling. Furnish devices which are designed to support pilasters from structure without transmitting load to ceiling finish. Furnish 3 inch high stainless steel trim piece, finished to match hardware, at each pilaster.

2.1.8.6 Wall-Hung Screens: Furnish panel units of same construction and finish as partition system panels.

2.1.8.7 Floor-Supported Screens: Furnish pilasters not less than 1 inch in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.

2.1.8.8 Furnish Hardware for each compartment in partition system, as follows:

- a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
- b. Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
- c. Coat hook with combination hood and rubber-tipped bumper.
- d. Door pull.

2.2 Metal Toilet Partitions and Urinal Screens:

2.2.1 Toilet Enclosures shall conform to Fed. Spec. RR-P-1352, Type I, Style A, B, or C as required. Finish surface of panels shall be baked enamel, in color as required. Panels to receive toilet paper holders or grab bars shall be reinforced for the reception of the items required.

2.2.2 Room Entrance Screens shall conform to Fed. Spec. RR-P-1352, Type II, Style A. Finish surface of screens shall be baked enamel.

2.2.3 Urinal Screens shall conform to Fed. Spec. RR-P-1352, Type III, Style A or D, as required. Finish surface of screens shall be baked enamel. Width of Style A screens shall be 24 inches or 36 inches, as required.

2.3 Shower and Dressing Compartments:

2.3.1 General: Materials shall be provided which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Shower compartments shall include a shower receptor for each compartment.

2.3.2 Steel Sheets for Baked Enamel Finish shall be ASTM A 591, Class C, galvanized-bonderized, of the following minimum thicknesses:

- a. Pilasters (overhead-braced): 20-gauge.
- b. Panels and Screens: 20-gauge.
- c. Doors: 22-gauge.

2.3.3 Concealed Anchorage Reinforcement shall be minimum 12-gauge galvanized steel sheet.

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2.3.4 Concealed Tapping Reinforcement shall be minimum 14-gauge galvanized steel sheet.

2.3.5 Core Material for Metal Partitions shall be manufacturer's standard sound-deadening honeycomb of impregnated kraft paper, in thickness to provide finished dimension of 1 inch minimum for doors, panels, and screens and 1-1/4 inches minimum for pilasters.

2.3.6 Pilaster Shoes shall be ASTM A 167, Type 302/304 stainless steel, not less than 3 inches high, 20-gauge, finished to match hardware.

2.3.7 Stirrup Brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.

2.3.8 Hardware and Accessories shall be manufacturer's standard design, heavy-duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium-plated brass, as required.

2.3.9 Overhead Bracing shall be continuous extruded aluminum tubing in antigrip profile, with clean anodized finish.

2.3.10 Anchorages and Fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.3.11 Fabrication:

2.3.11.1 Furnish Standard Doors, Panels, Screens, and Pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as required.

2.3.11.2 Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors.

2.3.11.3 Pressure Laminate Seamless Face Sheets to core material and seal edges with continuous interlocking strip or with lapped and formed edges. Weld edges and corners, with exposed welds ground smooth.

2.3.11.4 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.

2.3.11.5 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

2.3.11.6 Furnish Hardware for each dressing compartment as follows:

- a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
- b. Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
- c. Coat hook, with combination hook and rubber-topped bumper.
- d. Door pull.



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2.3.11.7 Accessories: Each dressing compartment shall be provided with the following accessories: shower curtain rod, curtain, hooks, soap dish, and wood seat.

2.3.12 Finish for Compartments and Showers shall be baked enamel. Clean galvanized steel surfaces after fabrication and before application of enamel coating system to remove processing compounds, oils, and other contaminants. Prime metal with baked-on rust-inhibitive primer. Apply two coats of thermosetting enamel finish, applied by electrostatic process, and baked in accordance with paint manufacturer's instructions.

2.3.13 Shower Receptor shall be pre-cast terrazzo, made of marble chips cast in white Portland cement. Provide wrought brass drain bodies cast integrally in receptor. Drain bodies shall provide for caulked lead connection not less than one inch deep to a two-inch pipe, with a removable type stainless steel strainer. Shower receptor curb shall be rabbeted 1 inch deep to receive steel shower walls. Receptors shall have an integral steel flange, 6-inch minimum height, on all sides except at threshold location.

3.0 EXECUTION:

3.1 Installation: Partitions associated with compartments and cubicles shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Anchorage to walls shall be by through-bolting or toggle-bolting as required. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work.



SECTION 10260 WALL AND CORNER PROTECTION

PART

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 256 (1990b) Impact Resistance of Plastics and
Electrical Insulating Materials

ASTM D 635 (1991) Rate of Burning and/or Extent
and Time of Burning of Self-Supporting
Plastics in a Horizontal Position

ASTM E 84 (1991a) Surface Burning Characteristics
of Building Materials

FEDERAL STANDARDS (FED-STD)

&FED-STD 795 (Basic) Uniform Federal Accessibility
Standards

SOCIETY OF AMERICAN AUTOMOTIVE ENGINEERS (SAE)

SAE J1545 (1986) Instrumental Color Difference
Measurement for Exterior Finishes, Textiles
and Color Trim

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Corner Guards; FIO

Manufacturer's descriptive data, catalog cuts, and installation instructions, and recommended cleaning instructions.

SD-13 Certificates



Corner Guards; FIO

Statements attesting that the items comply with specified fire and safety code requirements.

SD-14 Samples

Finish; GA

Manufacturer's standard samples indicating color and texture of materials requiring color and finish selection.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Materials shall be kept dry, protected from weather and damage, and stored under cover. Materials shall be stored at approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

PART 2 PRODUCTS

2.1 GENERAL

To the maximum extent possible, corner guards shall be the standard products of a single manufacturer and shall be furnished as for all outside corners in corridors.

2.1.1 Resilient Material

Resilient material shall consist of extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic and shall conform to the following:

2.1.1.1 Minimum Impact Resistance

Minimum impact resistance shall be 18 ft. lb/sq. (18 ft. lbs/sq. inch) when tested in accordance with ASTM D 256 (Izod impact, ft.lbs per inch notch).

2.1.1.2 Fire Rating

Fire rating shall be Class 1 when tested in accordance with ASTM E 84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material shall be rated self extinguishing when tested in accordance with ASTM D 635. Material shall be labeled and tested by Underwriters Laboratories or other approved testing laboratory. Resilient material used for protection on fire rated doors and frames shall be listed by the testing laboratory performing the tests. Resilient material installed on fire rated wood/steel door and frame assemblies shall have been tested on similar type assemblies. Test results of material tested on any other combination of door/frame assembly will not be accepted.

2.1.1.3 Integral Color

Colored components shall have integral color and shall be matched in accordance with SAE J1545 to within plus or minus 1.0 on the CIE-LCH scales. Color is indicated in Section 09915 COLOR SCHEDULE.

2.2 CORNER GUARDS



2.2.1 Resilient Corner Guards

Corner guard units shall be flush mounted or surface mounted radius formed to profile shown. Corner guards shall extend from floor to ceiling. Mounting hardware, cushions, and base plates shall be furnished. Assembly shall consist of a snap-on corner guard formed from resilient material, minimum 1.98 mm thick, mounted on a continuous retainer. Extruded aluminum retainer shall conform to ASTM B 221, alloy 6063, temper T5 or T6. Flush mounted type guards shall act as a stop for adjacent wall finish material. Factory fabricated end closure caps shall be furnished for top and bottom of surface mounted corner guards. Flush mounted corner guards installed in fire rated wall shall maintain the rating of the wall. Insulating materials that are an integral part of the corner guard system shall be provided by the manufacturer of the corner guard system. Exposed metal portions of fire rated assemblies shall have a paintable surface.

2.3 WALL GUARDS (BUMPER GUARDS)

Wall guards, Combination Handrail/Wall guards and Handrails

Wall guards, combination handrail/wall guards, and handrails shall be provided with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories standard with the manufacturer. Extruded aluminum retainers shall conform to ASTM B 221, alloy 6063, temper T5 or T6. End caps and corners shall be field adjustable to assure close alignment with handrails and wall guards.

Wall Guards/Bed locators

Wall guards shall consist of snap-on covers of high impact resistant resilient material, minimum of 1.98 mm (0.078 inch) thick, mounted over 2 inch wide aluminum, minimum 1.57 mm (0.062 inch) thick retainer, anchored to wall at maximum 600mm (24 inches) on center.

Combination Handrails/Wall Guards

Combination handrail/wall guards shall consist of snap-on covers of high impact resistant resilient material, minimum 1.98 mm (0.078 inch) thick on a continuous, extruded aluminum retainer, minimum 1.83 mm (0.072 inch) thick anchored to wall at maximum 800mm (32 inches) on center. Handrails shall be in accordance with the requirements of 36 CFR 1191 that provide equal or greater accessibility than the requirements of FED-STD 795.

Handrails

Handrails shall consist of snap-on covers of high impact resistant resilient material, minimum 1.98 mm (0.078 inch) thick on a continuous, extruded aluminum retainer, minimum 1.83 mm (0.072 inch) thick anchored to wall at maximum 800mm (32 inches) on center. Handrails shall be provided with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories standard with the manufacturer. End caps and corners shall be field adjustable to assure close alignment with handrails.

Handrails shall be in accordance with the requirements of 36 CFR 1191 that provide equal or greater accessibility than the requirements of FED-STD 795

Door Protectors



Door protection items shall consist of high impact resistant acrylic vinyl or polyvinyl chloride resilient material, minimum 1.52 mm (0.060 inch) thick for door and 0.89mm (0.035 inch) thick for door frames.

High Impact Wall Panels

Wall panel face and edge thickness shall be 0.56mm (0.22 inch) thick. Panel face shall be factory banded to a 9.53 mm (0.375 inch) thick fiberboard core. The backside of the panel shall be laminated with moisture resistant vapor barriers.

2.4 FASTENERS AND ANCHORS

Fasteners and anchors shall be provided for each specific installation.

2.4 FINISH

2.4.1 Resilient Material Finish

Finish for resilient material shall be embossed texture with colors in accordance with SAE J1545.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Corner Guards, Wall Guards, Combination Handrail/Wall guard, Handrails and Door protection items

Material shall be mounted at location indicated in accordance with manufacturer's recommendations.

-- End of Section --



SECTION 10275 ACCESS AND PEDESTAL FLOORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of access and pedestal floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Provide access flooring that, when installed, complies with NFPA 75, (components shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with NFPA 255 and ASTM E 84) unless otherwise directed. Flooring systems shall also comply with load tests referenced in Ceilings and Interior Systems Construction Association's (CISCA) "Recommended Test Procedures for Access Floors".

2.1 Panels shall be 24 inches by 24 inches square (+/- 0.015 inch) and shall be capable of withstanding a concentrated load of 1000 to 2000 pounds with a deflection of not greater than 0.010 inches and a rolling load of 600 to 1000 pounds per square foot with a deflection not to exceed 0.040 inches.

2.2 Pedestals shall be assemblies that are electrically conductive and corrosion-resistant. Each shall be capable of adjustments of 1/64-inch increments, have positive locking, and be capable of supporting a 5,000-pound axial load.

2.3 Stringers (on floors 18 inches in height or greater) shall be capable of individual removal and shall support 200 pounds.

2.4 Accessory Ramps, Handrails, and Fascia Plates shall be compatible with panels and pedestals.

3.0 EXECUTION:

3.1 Preparation: No installation of access flooring shall take place until structural floor surfaces are clean and dry.

3.2 Installation:

3.2.1 Completed System shall be rigid and free from vibration, with no rocking panels.

3.2.2 Floor shall be level within +/- 0.062 inch in any 10-foot area and +/- 0.10 inch over the entire area.



SECTION 10351 FLAGPOLES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flagpoles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Steel Flagpoles shall be constructed from standard weight steel pipe complying with ASTM A 53, Type S, Grade B, or steel tube complying with ASTM A 513. Fabricate shop and field joints without using pins, rivets, bolts, screw collars, or lead caulking.

2.2 Aluminum Flagpoles shall be fabricated from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch.

2.3 Stainless Steel Flagpoles shall be fabricated from alloy UNS S30400 pipe, tube, or plate complying with **ASTM A 312** (**ASTM A 312M**), ASTM A 269, or ASTM A 666.

2.4 Bronze Flagpoles shall be fabricated from alloy UNS C23000 seamless pipe or tube complying with ASTM B 43 or **ASTM B 135** (**ASTM B 135M**).

2.5 Fiberglass Flagpoles shall be fabricated from polyester-resin reinforced with woven glass-fiber roving with 75 percent of glass fibers parallel to the length of the flagpole.

2.6 Flagpole Style shall be cone-tapered, sectionally swaged, or entasis-tapered (slight convexity) and shall be of designated height and diameter.

2.7 Two Continuous Halyards shall be provided for each pole and furnished complete with all standard fittings.

2.8 Provide Anchors and Base necessary for the particular installation requirements.

3.0 EXECUTION

3.1 Flagpoles shall have a positive lightning ground for each installation.

3.2 Portions of Ground-Set Flagpoles shall be painted below ground with a heavy coat of bituminous paint.

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SECTION 10410 DIRECTORY AND BULLETIN BOARDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of directories and bulletin boards. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Directory Boards shall be grooved and covered with felt, vinyl, or rubber. Boards shall be fabricated of one piece of material. Space grooves at 1/4 inch O.C. to receive changeable letters or changeable name bases, as required.

2.1.1 Rear-Illuminated Directories: For each directory required, provide a surface-mounted, rear-illuminated-type directory consisting of a cabinet with an operable transparent cover, containing a concealed illumination system, and a retainer frame containing a header panel and message strips. Graphics for message strips, header panels, and other designs shall be in the letter style, size, spacing, and arrangement indicated.

2.1.2 Non-illuminated Directories: Provide a fully recessed, non-illuminated directory consisting of a cabinet with an operable transparent cover, and a retainer frame containing a header panel and a letter board or removable message strips. Graphics for message strips, header panels, and other designs shall be in the letter style, size, spacing, and arrangement indicated.

2.2 Chalkboard Surfaces shall comply with Porcelain Enamel Institute specifications.

2.3 Tack Board Surfaces shall be natural cork, plastic-impregnated cork, or vinyl fabric laminated under pressure to 1/4 inch thick exterior plywood, hardboard or fiberboard backing.

2.4 Visual Aid Boards shall have a white porcelain enamel writing surface.

2.5 Bulletin Boards shall be surface-mounted and top-illuminated consisting of a cabinet housing with an operable transparent cover, containing a top-illumination system, and with tackable surface of material indicated. Provide graphics for header panels and other designs in the letter style, size, spacing, and arrangement indicated.

2.6 Frames shall be constructed of hardwood, chrome-plated steel, aluminum, bronze, or stainless steel of designated design. All units located on the exterior shall be of weatherproof construction.

2.7 Glass for Encased Boards shall be clear/bronze/gray float glass, laminated glass, tempered glass, acrylic sheeting, or polycarbonate sheeting.

2.7 Locks and Keys for Glass-Encased Boards shall be of the disk tumbler type with two keys.

2.8 Fabrication: Fabricate directories and bulletin boards to requirements indicated, including dimensions, design, and thickness and finish of materials. Use metals and shapes of thickness, with reinforcing if needed, to produce flatness, free of oil canning, and to impart strength for size, design, and application indicated.



2.8.1 Fabricate perimeter cabinet and cover frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

2.8.2 Hardware for Covers: Equip covers with hardware of type indicated.

2.8.3 Weatherproofing: For units located on the exterior, provide weatherproof construction, including weather-stripping and venting provisions for condensation control.

3.0 EXECUTION:

3.1 Installation: Install units plumb and level, in locations and with mountings shown. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

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SECTION 10430 SIGNS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of signs. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cast-Aluminum Letters shall have a satin, polished, clear anodized, colored anodic, or enameled finish.

2.2 Cast-Bronze Letters shall have a satin, polished, or oxidized finish.

2.3 Cast Metal Plaques shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and thickness, and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce manufacturer's standard satin polished finish.

2.4 Special Medallion Construction shall be of cast bronze or aluminum, free from pits, scale, second holes, or other defects.

2.5 Adhesive Door Signs shall be fabricated from individually die cut-to-shape letters that are pre-spaced and pre-masked on a high-quality plastic film coated with a pressure-sensitive adhesive backing.

2.6 Hard Plastic Door Signs shall be made from high-pressure plastic laminate engraving stock with face and core plies in contrasting colors.

2.7 Panel Signs shall comply with the materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction. Produce smooth, even, level sign surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

2.8 Frames For Plastic Door Signs shall be made of solid extruded aluminum with an anodized gold or silver finish and concealed mounting holes. Frames shall be designed to allow signs to slide in from the side.

3.0 EXECUTION:

3.1 Installation: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.



SECTION 10440 INTERIOR SIGNAGE

PART

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

FEDERAL SPECIFICATIONS (FS)

FS L-P-387 (Rev A; Am 1; Int Am 2) Plastic Sheet, Laminated, Thermosetting (for Designation Plates)

FEDERAL STANDARDS (FED-STD)

FED-STD 795 (Basic) Uniform Federal Accessibility Standards

MILITARY SPECIFICATIONS (MS)

MS MIL-M-43719 (Rev B; Am 1) Marking Materials and Markers, Adhesive, Elastomeric, Pigmented

1.2 GENERAL

Interior signage shall be of the sizes and types shown on the drawings, shall conform to the requirements specified herein, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. Signs shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Interior Signage; FIO

Manufacturer's descriptive data, catalogs cuts and installation instructions.

SD-04 Drawings

Interior Signage; GA

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Drawings shall include elevations of each type of sign and shall show dimensions, details and methods of mounting or anchoring, shape and thickness of materials, and details of construction. A schedule showing the location of each sign type shall be included.

SD-14 Samples

Interior Signage; GA

Samples of the following signs showing typical quality and workmanship. The samples may be installed in the work, provided each sample is identified and location recorded.

- a. Room identification sign (mounted on wall adjacent to door)

Directional signage

Building directory

Departmental/Information sign

- e. Fire evacuation sign (as required)

Two samples of manufacturer's standard color chips for each material requiring color selection.

1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use for at least 2 years prior to bid opening.

1.5 DELIVERY AND STORAGE

Materials shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area.

Extra Stock

The Contractor shall provide 10 extra frames and extra stock of the following:
10 blank plates of each color and size for sign types; 2 full sets of pressure sensitive letters in each color and size for sign type; 25 changeable message strips for sign type.

PART 2 PRODUCTS

2.1 ROOM IDENTIFICATION/DIRECTIONAL SIGNAGE SYSTEM

Sign type shall be type signage system as shown. Signs shall be fabricated of acrylic plastic conforming to ANSI Z97.1.

Standard Room Signs



Signs shall consist of matte finish acrylic plastic, thickness and size as shown on the drawings. Frames shall be molded acrylic or wood. Corners of signs shall be either squared or 3/8" radius.

Changeable Message Strip Signs

Changeable message strip plaque signs shall consist of acrylic or plexiglass back laminated to matte finish acrylic plastic face with message slots as detailed for insertion of changeable message strips. Thickness and size of signs shall be as shown. Individual 1/16 inch thick message strips to permit removal, change, and reinsertion shall be provided as detailed. Corners of signs shall be either squared or 3/8" radius.

2.1.3 Mounting of Plaque Signs

Mounting for framed, hanging, and projecting signs shall be by holes and screws.

2.1.4 GRAPHICS

2.1.4.1 Tactile Graphics

Signage that provides permanent identification (room numbers, toilet rooms, janitors closets, etc.) shall be tactile (perceptible to touch) and shall comply with Americans With Disabilities Act. Characters, symbols, or pictographs on tactile signs shall be raised 0.8 mm minimum. Tactile letters and numbers shall be sans serif upper case. Tactile characters or symbols shall be at least 15 mm high, but no higher than a nominal 50 mm. Characters and symbols shall contrast with their background. Color to be as indicated in Section 09915 COLOR SCHEDULE.

2.4.2 Graphics Application

Message for toilet room signage shall be acrylic letters 3 mm thick and chemically welded to 3.17 mm thick acrylic backup sheet.

2.4.3 Messages

See drawings for message content, typeface and type size.

2.1 ACRYLIC SHEET

Acrylic sheet for panels and components shall conform to ANSI Z97.1.

2.2 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

2.3 FABRICATION AND MANUFACTURE

2.3.1 Workmanship

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Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

2.4 PLAQUE SIGNS

Plaque signs shall be a modular type signage system. Signs shall be fabricated of Type ES melamine plastic conforming to \-FS L-P-387-\, Type NDP self-extinguishing or acrylic conforming to \-ANSI Z97.1-\ as shown. Color to be as indicated in Section 09915 COLOR SCHEDULE.

2.4.2 Modular Changeable Message Strip Plaque Signs

Changeable message strip plaque signs shall consist of acrylic or plexiglass back laminated to matte finish acrylic plastic face with message slots as detailed for insertion of changeable message strips. Thickness and size of signs shall be as shown. Individual 1.6 mm thick message strips to permit removal, change, and reinsertion shall be provided as detailed. Corners of signs shall be squared. Plaque signs affixed to Barracks entrance doors to have room number engraved as shown on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Signs shall be installed at locations shown on the drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed.

3.1.1 Anchorage

Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned.

--End of Section--



SECTION 10452 SECURITY SCREENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of security screens for doors and windows. Products shall match existing materials and shall be as directed by the Contracting Officer. Installations shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mesh shall be 9-gauge crimped steel wire woven into 2-inch mesh securely clinched to frame members.

2.2 Standard Diamond Pattern Expanded Metal shall be 1-1/2 inch, 9-gauge, carbon steel conforming to ASTM F 1267 Type I Class 1.

2.3 Flattened Diamond Pattern Expanded Metal shall be 1-1/2 9-gauge carbon steel conforming to ASTM F 1267 Type II Class 1.

2.4 Frame Bars and Center Stiffeners shall be not less than 1/2-inch in diameter cold finished steel bars conforming to ASTM A 108.

2.5 Frame Channels shall be hot rolled low carbon bar channels not less than 1-inch by 1/2-inch by 1/8-inch conforming to ASTM A 29.

2.6 Center Stiffeners where frame channels are used, shall be not less than two 3/4-inch by 3/8-inch channels, conforming to ASTM A 29, bolted to each side.

2.7 Sub-frames for Hinged Security Screens shall be not less than 1-1/4 inch by 1-1/4 inch by 1/8-inch medium carbon steel angles conforming to ASTM A 36.

2.8 Finish: Manufacturer's standard shop-applied enamel finish or hot dipped galvanized as directed.

2.9 Provide Bolts, Masonry Anchors, Hardware, and Accessories for complete installation. Hardware shall include all padlock hasps and staples, hinges, and locking devices. Provide cylinders for locks, keyed and mastered keyed, if required.

3.0 EXECUTION:

3.1 Erect Security Screens plumb, rigid, properly aligned, and securely anchored in place for a rigid installation

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SECTION 10505 METAL LOCKERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal lockers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Materials and Finishes:

2.1.1 Stainless Steel: ASTM A 666, Type 304, stretcher-leveled standard of flatness. Roller-apply texture to doors in manufacturer's standard pattern.

2.1.2 Carbon Steel: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

2.1.3 Expanded Metal: ASTM F 1267, Type II (flattened), 3/4-inch mesh, minimum 0.0747 inch thick, with at least 70 percent open area.

2.1.4 Galvanized Steel Sheet: ASTM A 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

2.1.5 Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, commercial quality, coating Class C; mill phosphatized; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

2.1.6 Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

2.1.7 Plastic Laminate: NEMA LD 3, Grade PF-42, 0.042-inch nominal thickness.

2.1.8 Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.2 Wardrobe Lockers:

2.2.1 Backs and Sides of lockers shall be fabricated of minimum 24-gauge steel with double flanged connections extending full height. Top and bottom shall be of not less than 24 gauge steel with flanged edges. Exposed ends of non-recessed lockers shall be of a minimum 16-gauge steel. Provide one 24-gauge steel hat shelf in single-tier units.

2.2.2 Doors shall be one-piece construction of minimum 16-gauge sheet steel, flanged at all edges. Provide extra bracing or reinforcing on inside of doors over 15 inches wide. Fabricate to prevent springing when opening or closing, and to swing 180 degrees.



2.2.3 Ventilation: Provide stamped, louvered vents in door face. Single-tier lockers shall have not less than 6 louver openings top and bottom. Double-tier lockers shall have not less than 3 louver openings top and bottom. Multi-tier lockers shall have not less than 2 louver openings top and bottom, or 3 louver openings top or bottom.

2.2.4 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5- or 7-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners, which are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches high and over, at least 2 hinges for each door less than 42 inches high.

2.2.5 Standard Hardware Items, including coat-hooks, sequential number plates, and arrangements for locking devices, shall be provided.

2.3 Box (Athletic) Lockers:

2.3.1 Tops and Bottoms of lockers shall be fabricated from minimum 16-gauge steel sheet and backs from not less than 18-gauge steel. Sides and intermediate partitions shall be constructed of expanded metal welded to steel hemming. Provide 16-gauge steel shelf in single-tier lockers.

2.3.2 Doors shall be manufacturer's standard of either expanded metal in a steel frame or one-piece perforated steel sheet with flanged edges, minimum 16 gauge. Provide extra bracing or reinforcing on inside of doors over 15 inches wide.

2.3.3 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners which are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches and over, at least 2 hinges for each door less than 42 inches high, or continuous piano hinge at top for multi-tier units. Manufacturer shall provide all necessary hardware including sequential number plates and arrangements for locking devices.

2.4 Basket Locker: Rack shall have legs for fastening to the floor and sway braces. Racks shall be designed to allow bolting together to form double-faced racks.

2.4.1 Uprights on Rack shall be a minimum of 13 gauge, shelves a minimum of 18 gauge, and dividers a minimum of 20 gauge, ribbed for stiffness.

2.4.2 Baskets shall be all wire or wire and minimum 24 gauge steel front with perforations. All baskets shall be zinc plated with a bright finish. Pilfer guards shall be available for all styles of baskets.

2.4.3 Hardware shall be provided as required for installation and functioning including sequential number plates and arrangements for locking.

2.5 Locker Benches:

2.5.1 Bench Tops shall be manufacturer's standard one-piece units minimum 9-1/2 inches wide by 1-1/4 inches thick, with rounded corners and edges. Material shall be laminated maple coated with sealer and lacquer, or plastic laminate over medium-density particle board core, or extruded aluminum with anodized finish.

2.5.2 Pedestals: Provide manufacturer's standard pedestal supports, with predrilled fastener holes, complete with fasteners and anchors. Furnish a minimum of two pedestals for each bench, with pedestal spacing not more than 72 inches o.c. Materials shall be tubular steel with flanges and baked enamel finish or aluminum channels/standard bar stock trapezoid shaped painted to match locker units.

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3.0 EXECUTION: Lockers and locker benches shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.



SECTION 10520 FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire extinguishers, cabinets, and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fire Extinguishers shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in compliance with NFPA 10 and its appendices. Fire extinguishers shall be clearly marked to indicate extinguisher suitability according to class of fire.

2.2 Fire Extinguisher Cabinets and Accessories shall be in compliance with NFPA 10 and its appendices and shall be of sufficient size to house fire extinguishers of the type and capacity required. Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames. Provide manufacturer's standard alarm, which actuates when cabinet door is opened and is battery or low voltage powered.

3.0 EXECUTION:

3.1 Fire Extinguishers shall be distributed and maintained in compliance with NFPA 10 and its appendices.

3.2 Fire Extinguisher Cabinets and Accessories shall have the locations of fire extinguishers readily recognizable by the use of markings that are not part of the extinguisher itself. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction. Prepare recesses for cabinets as required by type and size of cabinet and trim style. Fasten mounting brackets to structure and cabinets, square and plumb. Fasten cabinets to structure, square and plumb.



SECTION 10550 POSTAL SPECIALTIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mail chutes and mail boxes. Materials shall match existing materials and/or as shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: All products shall comply with U.S. Postal Service requirements for construction and installation of units serviced by USPS carriers.

2.2 Mail Chutes must be approved according to USPS Publication 16. Chutes shall have sides and back that are of a continuous one-piece construction of minimum 0.125 inch aluminum sheet extending from floor to ceiling on each floor and extending 4 feet 6 inches above finish flooring on top floor. Back and sides shall have satin anodized finish complying with ANSI/BHMA A156.18. Removable front panels shall comply with USPS Publication 16 for at least three-fourths of the length of the front of the chute on each floor, set into continuous one-piece frames and covers. Frames and covers shall be fabricated from aluminum with a 0.125 inch minimum thickness with satin anodized finish complying with ANSI/BHMA A156.18, or bronze anodized, bronze sheet cladding over aluminum, or stainless steel cladding over aluminum.

2.2.1 Furnish Manufacturer's Standard Cast-Metal Floor and Ceiling Fascia and Lock Band finished to match front frames and covers. Furnish lock band with acceptable locking device and keyed lock which prevents key removal if locking device is not secured.

2.2.2 Mail Slot shall be standard pocket with cigarette ejector, finished to match front frames and covers. Inscribe "U.S. MAIL" on face of mail slot.

2.2.3 Bundled Mail or Package Chute shall be constructed similarly to standard mail chutes. Furnish complete with removable frames, hinged lock band, bottom deflector or baffle slow-down, and mail openings on each floor. Fabricate chute size 14 inches wide and 7 inches deep, unless otherwise indicated. Bundled mail chutes will not require USPS approval.

2.2.4 Locked Receiving Mail Box shall be recessed or surface-mounted units as indicated, complete with pull-down inlet door and hinged door with post office lock. Construct boxes and letter them to comply with USPS Publication 16. Provide units with hooks to hold mail sack open. Fabricate door of minimum **1/4-inch** thick metal extrusion or plate and other components of the same material in sheet form. Boxes shall have satin anodized finish complying with ANSI/BHMA A156.18, or satin bronze anodized, or stainless steel with No. 4 finish. Boxes shall be 36 inches by 20 inches by 12 inches.

2.3 Mail Boxes: All horizontal-type and vertical-style mailboxes shall comply with USPS Publication 17 in size and with features indicated. Neighborhood delivery and collection box units shall comply with USPS Publication 18 in size and with features indicated. Parcel lockers shall comply with USPS Publication 15 and USPS Publication 18 for outdoor units. Mail boxes shall have aluminum finish complying with ANSI/BHMA A156.18 or stainless-steel finish complying with ASTM A 480.

2.3.1 Letter Slot shall be metal, designed for flush mounting. The legend "U.S. MAIL" must be plainly inscribed on every mail opening.



2.3.2 Rural Letter Box shall be post-mounted type and shall have a heavy-duty piano hinge and red flag. Doors shall have legend "U.S. MAIL" plainly inscribed. Boxes shall have a polyurethane baked-on finish that resists rust.

2.3.3 Apartment House Keyed Mail Boxes: Mail compartments and wall receptacles shall be of heavy galvanized steel or corrosion-resistant metal construction. Each compartment shall be designed to receive name card and shall bear identification numbers as directed.

2.3.4 Letter Box with Combination Lock: Each compartment shall be equipped with a single-dial, 3-digit combination lock and shall be provided with identification numbers.

2.3.5 Letter Box with Keyed Lock: Each compartment shall be equipped with a 5-pin tumbler cylinder lock capable of at least 1,000 key changes, with 2 keys for each box door. Each box shall be keyed differently and a master key shall be provided. Provide identification numbers for each compartment.

2.3.6 Parcel Lockers: Each compartment shall be equipped with a dual-lock mechanism that retains the tenant key until released by USPS control key. The door lock shall be a 5-pin cam lock, and the key retainer lock shall be either an Arrow postal lock or another USPS-approved lock.

2.3.7 Key Keeper: The recessed-mounted key keeper shall match material and finish of mailboxes prepared for Arrow lock to be installed by USPS. The key keeper shall be made by the manufacturer of installed mailboxes.

3.0 EXECUTION: Install postal specialties so that they comply with U.S. Postal Service requirements.



SECTION 10605 WIRE MESH PARTITIONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wire mesh partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Mesh shall be **0.135-inch-** diameter, inter-crimped steel wire woven into **1-1/2-inch** diamond mesh, securely clinched to frame members.

2.2 Frames: Provide cutouts for pipes, ducts, beams, and other items necessary for partition installation. Finish edges of cutouts to provide a neat, protective edge.

2.2.1 Vertical Members shall be 1-1/4 inch x 5/8-inch x 0.1046 inch cold-rolled steel C-Section channels with 1/4-inch diameter bolt holes approximately 18 inches on center.

2.2.2 Horizontal Members shall be 1-inch x 1/2-inch x 1/8-inch cold-rolled steel channels, mortised and tenoned to vertical members.

2.2.3 Horizontal Reinforcing Members shall be 1-inch x 1/2-inch x 1/8-inch cold-rolled steel channel with wire woven through or two 1-inch x 1/2-inch channels bolted or riveted toe to toe through mesh and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height as recommended by partition manufacturer.

2.3 Stiffening Bar: For free-standing partitions over 12 feet -0 inches in height, provide flat bar stiffener posts between abutting panel frames. Size as recommended by partition manufacturer for partition height required. Increase size of stiffening bars, if required, to maintain partition rigidity.

2.4 Top Capping Bars shall be 2-1/4 inch x 1-inch cold-rolled steel channels, secured to top framing channel with 1/4-inch diameter U-bolts spaced not more than 28 inches on center.

2.5 Corner Posts shall be 1-1/4 inch x 1-1/4 inch x 1/8-inch steel angles with floor shoe and 1/4-inch diameter bolt holes to align with bolt holes in vertical frame members and floor plate.

2.6 Floor Shoes shall be cast metal, sized to suit vertical framing and to provide approximately 3 inches clear space between finished floor and bottom horizontal frame members. Furnish units with set screws for leveling adjustment.

2.7 Sheet Metal Base shall be panels formed to 0.0598 inch thick steel sheet, welded or bolted to frames.

2.8 Hinged Door: Door frame shall be of 1-1/4 inch x 1/2-inch x 1/8-inch steel channels, with 1-1/4 inch x 1/8-inch flat steel bar cover plate on 3 sides and matching 1/8-inch thick angle strike bar and cover on lock side. Provide 1-1/2 pairs of 3 by 3 inch butt hinges riveted or welded to door and frame, and bronze mortise type cylinder lock operated by key outside with recessed knob inside. Align bottom of door with bottom of adjacent panels. Provide cylinders for lock, keyed and master keyed, if required.



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2.9 Sliding Door: Door frame shall be of 1-1/2 inch x 3/4-inch x 1/8-inch steel channels with 1-1/2 inch x 1/8-inch flat steel bar cover plate on all 4 sides. Provide door with two 4-wheel roller bearing carriers, box track, bottom guide channel, and bronze mortise type cylinder lock operated by key outside and recessed knob inside. Align bottom of door with bottom of adjacent panels. Provide cylinders for locks, keyed and master keyed, if required.

2.10 Service Window: Fabricate of same mesh and frames as panel units, arranged to lock in open and closed positions with spring catches. If size not shown, 24 inches wide by manufacturer's standard height.

2.11 Service Window Shelf: Size as shown or, if not shown, approximately 12 inches deep and 24 inches wide. Fabricate of 0.1046-inch- thick steel, braced with brackets as required and as recommended by manufacturer, corners rounded, and edges finished smooth.

2.12 Line Posts: Where partition runs exceed 20 feet without intersection or connection to overhead framing, furnish 3-inch by 4.1-lb steel channel line posts with 5-by-18-by-1/4-inch steel base plates located at recommended intervals to ensure partition rigidity and stability.

2.13 Intersection Posts: Where 3- or 4-way intersections occur, use 1-1/4-by-1-1/4-inch tubular steel posts with floor shoe and 1/4-inch- diameter bolt holes aligned for bolting to adjacent panels.

2.14 Finish: Manufacturer's standard shop-applied enamel finish.

2.15 Provide Bolts, Hardware, and Accessories for complete installation.

2.16 Steel Wire: ASTM A 853.

2.17 Steel Channels, Angles, Plates, and Bars: ASTM A 36.

2.18 Square Steel Tubing: Cold-formed structural steel tubing, ASTM A 500.

2.19 Galvanized Steel Wire: ASTM A 641.

2.20 Galvanized Steel Sheet: Commercial-quality, hot-dip-coated steel sheet, ASTM A 653, with G60 or A60 (ASTM A 653M, with Z180 or ZF180) coating.

3.0 EXECUTION:

3.1 Erect Partitions plumb, rigid, properly aligned, and securely anchored in place.

3.2 Provide Additional Field Bracing as necessary for rigid, secure installation.



SECTION 10615 DEMOUNTABLE PARTITIONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General Requirements: Movable partitions shall be floor-to-ceiling type, designed for erection on finished floors, and shall include doors, windows, fasteners, and accessories required for the installation. The partition system shall be capable of accommodating electrical wiring, outlets, and switches and shall be readily demountable without damage to panels, framing, electrical work, and other major components.

2.2 Fire-Resistive Rating and Test: Partitions shall have a flame spread rating of 25 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E 84. Fire-resistance rating shall be determined in accordance with ASTM E 119.

2.3 Sound Transmission Class and Test: Where sound-rated partitions are required, partition assemblies shall have a minimum STC of 40. STC range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.

2.4 Panel Units shall be manufacturer's standard construction except that gypsum wallboard shall be a minimum of 1/2 inch thick and shall conform to ASTM C 36. Gypsum backing board, if used, shall conform to ASTM C 442.

2.5 Framing System: The framing system shall consist of extruded anodized aluminum or roll-formed steel components that include ceiling runners, floor track, starting units, studs or posts, post covers if applicable, bracing, and suitable treated fasteners to prevent corrosion. The framing system when assembled with panel units shall form a rigid, stable partition.

2.6 Doors, Frames, and Hardware: Doors shall be 1-3/4 inch flush hollow metal of a size to provide 3/32-inch clearance at jambs and head. Door frames shall provide a compatible appearance with other trim components, shall be a minimum 0.0478 inch thick cold-rolled steel or 0.065 inch thick extruded anodized aluminum constructed to incorporate a cushion door stop at the head and both jambs, and shall allow for variations in floor level. Door hardware shall be the manufacturer's standard type hardware, except all doors shall receive 1-1/2 pairs of 4-1/2 inch by 4-1/2 inch butts.

2.7 Windows: Demountable partitions shall be complete with windows which are fully contained within the panel system. Window frames shall be sized as shown and assembled from minimum 0.065 inch thick extruded anodized aluminum parts or minimum 0.0478 inch cold-rolled steel and vinyl components.

2.8 Finishes: Exposed steel or aluminum surfaces shall be pre-finished. Gypsum wallboard shall be painted or finished with a minimum 6-mil vinyl wall covering, as required.

2.9 Base Trim shall be 4-inch high without exposed fasteners, 4-inch vinyl cover base with snap-on capabilities, 4-inch vinyl cover base applied with adhesive, or 4-inch metal clip on base cover, as required.



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3.0 EXECUTION: Partitions shall be erected plumb and straight after floor covering and finished ceiling are in place. Doors shall be hung to swing freely and hardware shall be carefully fitted and adjusted. Glass for glazed openings shall be installed on shims in a vinyl or polyurethane foam gasket. Glass stops shall be installed without exposed fastenings.

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SECTION 10630 MOVABLE METAL PARTITIONS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of movable metal partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Freestanding Partition Systems shall consist of individual panels, connector posts, and framing components. Nominal panel height shall be 5 feet-0 inches.

2.2 Panels shall be of manufacturer's standard width and height, constructed of 1/8-inch S2S tempered hardboard facing laminated to a core material. Total thickness shall be 1-9/16 inches.

2.3 Panel Face Coverings shall be vinyl, plastic laminate, fabric, natural hardwood, or baked enamel on steel substrate.

2.4 Panels shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84 when tested as a composite unit.

2.5 Framing Members shall be extruded aluminum shapes in 6063-T5 Alloy and 22-gauge pre-finished steel.

2.6 Exposed Components shall have anodized or baked acrylic paint finish.

2.7 Panel Frame Design shall provide connection and attachment of connector posts and various framing components with the use of simple hand tools. Each panel unit shall be able to be individually free-standing or connected to other panels.

2.8 Sound-Absorbing Panels shall be constructed of flame-resistant decorator fabric applied over a reinforced wood frame and fiberglass core. Flame-resistant fiberglass insulation shall be held in place by galvanized steel wire netting. Total panel thickness shall be 2-1/2 inches providing a minimum noise reduction coefficient (NRC) of 0.75.

3.0 EXECUTION: Additional framing components shall be provided as required to assemble the freestanding partitions. Components include, but are not limited to, vinyl edge inserts and filler caps, individual panel supports, and wall connectors.



SECTION 10677 METAL STORAGE SHELVING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal storage shelves. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Shelving Materials:

2.1.1 Steel Sheet: **ASTM A 366** matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

2.1.2 Galvanized Steel Sheet: **ASTM A 653, G90** coating designation; commercial quality; zinc-coated by the hot-dip process; stretcher leveled; phosphatized.

2.1.3 Electrolytic Zinc-Coated Steel Sheet: **ASTM A 591** with Class C zinc coating, mill phosphatized.

2.1.4 Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, stretcher-leveled flatness.

2.2 Shelves: Form of 0.0478-inch thick steel with front and rear faces double flanged and box channeled.

2.3 Brackets: Cantilever design, steel not less than 0.1046 inch thick and of hook-in-lift-off design, adjustable without use of tools.

2.4 Anchorage: 1/4-inch size bolts with standard nuts and lock washers.

3.0 EXECUTION: Storage shelving shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.



SECTION 10820 TOILET ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of toilet accessories other than porcelain type tile wall accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Finishes: Finishes on metal shall be provided as follows:

2.1.1 On Stainless Steel: No. 4 general-purpose polished.

2.1.2 On Carbon Steel, Copper Alloy, and Brass: Chromium-plated, bright.

2.2 Miscellaneous Accessory Items:

2.2.1 Mirror, Glass (MG): Glass mirror shall conform to Fed. Spec. DD-M-411.

2.2.2 Mirror, Metal (MM): Metal mirror shall be stainless steel or chromium-plated steel, mirror quality, 0.037-inch minimum thickness, edges turned back 1/4 inch and recess fitted with fiberboard backing, mounted with concealed theftproof fastening. Size shall be as required.

2.2.3 Grab Bar (GB): Grab bar shall conform to Fed. Spec. WW-P-541. Grab bar shall be form and length as required. Flange shall have screw mounting holes concealed on the lip of the flange. Installed bars shall be capable of withstanding a 500-pound vertical load without becoming loose from the fastenings and without obvious permanent deformation.

2.2.4 Shelf, Glass (SG): Glass shelf shall conform to Fed. Spec. WW-P-541 and shall be supported between brackets or on brackets. Shelf shall be plate or float glass, width and length as required. Separate supports shall be stainless steel.

2.2.5 Shelf, Metal, Heavy-Duty (SMHD): Heavy-duty metal shelf shall be stainless steel supported between brackets or on brackets not more than two feet on center. Thickness of shelf and brackets shall be not less than 0.07 inches. Shelf shall have rounded corners with minimum 1/2-inch lipped front edge, designed to support 60 pounds per linear foot. Width and length shall be as required.

2.2.6 Shelf, Metal, Light-Duty (SMLD): Light-duty metal shelf shall conform to Fed. Spec. WW-P-541. Shelf shall be supported between brackets or on brackets. Width and length shall be as required. Shelf and separate supports shall be stainless steel.



2.2.7 Soap and Grab Bar Combination, Recess-Mounted (SGR): Recess-mounted soap and grab bar combination shall conform to Fed. Spec. WW-P-541, stainless steel, modified to provide a grab bar. Plastic insert dish shall be furnished.

2.2.8 Towel Bar (TB): Towel bar shall conform to Fed. Spec. WW-P-541, stainless steel, length as required. Bar shall be minimum 3/4 inch in diameter. 2.2.9 Towel Pin (TP): Towel pin shall have concealed wall fastenings; pin shall be integral with or permanently fastened to wall flange, approximately 4-inch projection.

2.3 Dispensers and Receptacles:

2.3.1 Paper Towel Dispenser (PTD): Paper towel dispenser shall conform to Fed. Spec. WW-P-541.

2.3.1.1 Mounting S, Surface: Style N or O.

2.3.1.2 Mounting R, Recessed: Style P, Q, or T.

2.3.2 Sanitary Napkin and Tampon Disposer (SND): Sanitary napkin and tampon disposer shall conform to Fed. Spec. WW-P-541, stainless steel. Reusable liner of the type standard with the manufacturer shall be provided.

2.3.3 Sanitary Napkin and Tampon Dispenser (SNTD): Sanitary napkin and tampon dispenser shall conform to Fed. Spec. WW-P-541.

2.3.4 Waste Receptacle (WR) shall conform to Fed. Spec. WW-P-541.

2.3.5 Facial Tissue Dispenser (FTD) shall conform to Fed. Spec. WW-P-541.

2.3.6 Toilet Tissue Dispenser (TTD) shall conform to Fed. Spec. WW-P-541.

2.3.7 Toilet Paper Holder (TPH) shall conform to Fed. Spec. A-A-2524, roller mounted, 2 support brackets.

2.3.8 Toothbrush and Tumbler Holder (TTH) shall conform to Fed. Spec. WW-P-541.

2.3.9 Soap Dispenser (SD) shall be liquid type consisting of a stainless steel tank with hold capacity of 40 fluid ounces.

2.3.10 Soap Holder (SH) shall conform to Fed. Spec. WW-P-541.

2.4 Medicine Cabinets:

2.4.1 Medicine Cabinet (MC) shall conform to Fed. Spec. WW-P-541. Width, height, and depth of cabinet shall be as required.

2.4.2 Sliding Door Cabinet, Class 1, assembly shall be surface-mounted vanity or recessed cabinet with design and lighting arrangement as required.

2.4.3 Swinging Door Cabinet, Class 2, Design and assembly, including the lighting arrangement, shall be as required. Assembly shall be surface or recess-mounted.

2.5 Shower Curtains and Rods:

2.5.1 Shower Curtain (SC) shall conform to CID A-A-2398, Style I, size as required to suit conditions.

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2.5.2 Shower Curtain Rods (SCR) shall be stainless steel 1 inch OD by 0.049 inch minimum, straight or bent as required to meet installation conditions.

2.6 Hand Dryer shall be electrically operated conforming to Fed. Spec. W-H-50. Unit shall be surface-mounted, semi-recessed or flush-mounted as required. Cover face shall be polished aluminum, cadmium-plated, polished chrome, stainless steel, or porcelain. Fan shall deliver a minimum of 150 cfm at the discharge end of the nozzle.

2.7 Ash Urn shall be wall-mounted, paraboloidal shape, two quart capacity conforming to Fed. Spec. RR-A-1255. Urn shall be 22-gauge type 304 stainless steel with satin finish or satin bronze finish.

2.8 Janitorial Material:

2.8.1 Mop and Broom Holder shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.

2.8.2 Utility Shelf with mop and broom holders shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.

2.8.3 Pail or Ladder Hook shall be 12-gauge stainless steel, bright polished finish projecting 8 inches from wall, 6 inches high, and 1 inch wide.

2.9 Hospital Accessories:

2.9.1 Foot Operated Soap Dispenser: Dispensing mechanism shall be non-corroding containing a stainless steel hood and shatter-proof container. The unit shall contain a molded rubber foot pump with non-slip base.

2.9.2 Bed Pan Storage Rack: Rack shall be stainless steel surface-mounted providing storage for bed pans and urinals.

3.0 EXECUTION: Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory, except exposed fasteners in designated areas shall be of tamper-proof design.



SECTION 10911 WARDROBES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood or steel wardrobes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacture's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Design: Wardrobes shall be constructed of either wood or steel at the Contractor's option except when necessary to match existing or where one type is better suited for locality and intended usage. The material selected shall be used throughout the project. Design of wardrobes shall be by the Contractor using specified requirements as a minimum of acceptability. Each wardrobe shall be a complete unit capable of relocation without modifying or adding components, except for anchors and scribes. Common sides or backs between adjacent units are not permissible. The dimensions indicated are for the purpose of establishing general layout. Minor variations necessary to coordinate the details of construction will be permitted. All parts shall be manufactured to standards that will permit replacement without modifying of remaining parts.

2.0 PRODUCTS

2.1 Hardware:

2.1.1 Hinges shall be brass or steel, not less than 0.062 inch thick, 5 knuckle, tamper-proof institutional type, joint length not less than 2-1/2 inches, chromium finish or primed for paint finish. When doors are closed, only a smooth beveled and rounded joint shall be exposed. Doors 42 inches and less on the hinged side shall have two hinges; doors more than 42 inches on the hinged side shall have three hinges.

2.1.2 Latches: The active door of double doors on the clothes hanging compartment shall be provided with a three-point latching and locking mechanism. The handle shall be of the lever type, of cast brass or bronze, and shall be designed to permit locking by padlocking the handle to a steel keeper with a matching hole. A 14-gauge rectangular corrosion resisting steel shield shall be provided to protect the door from damage at the handle and padlock area. The interior components of the mechanism shall include locking bars or rods not less than 1/2-inch thick, two steel upper guides and two steel lower guides, three-finger cam, and applied strikes or reinforced openings for latching. The handle, keeper, and locking bars or rods shall have a chromium finish, and all other components shall have a chromium, nickel, zinc, or cadmium plated finish. Doors to overhead storage compartment, when separate from clothes hanging compartment doors, shall be provided with a heavy-duty catch and strike which will latch automatically when the overhead storage compartment is closed and which can be released manually when the clothes hanging compartment doors are open.

2.1.3 Clothes hanging rods shall be chromium plated or zinc-coated steel tubing approximately 1 inch in diameter and with a minimum wall thickness of 0.083 inch. Clothes hanging rods with exposed ends shall be provided with plastic caps to prevent marring the finish on the inside of the wardrobe.

2.1.4 Drawer Slides shall be heavy duty 14-gauge steel mating channels equipped with replaceable nylon-tired rollers or self-lubricating double-prong plastic glides located to insure that the drawer will operate freely and smoothly throughout its travel. Slides shall have integral cushioned stops at both ends of the travel, shall permit removal of drawers without tools, and shall be free of excessive play or sag.

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2.1.5 Silencers of rubber or similar resilient material shall be provided on door frames at close proximity to each latching point to minimize noise when the door is closed. Silencers shall be replaceable.

2.1.6 Astragals: Active door of double doors shall be provided with an astragal, full height of the door.

2.2 Steel Sheets shall be cold-rolled, commercial quality, stretcher level degree of flatness and of manufacturer's standard gauges specified.

2.3 Steel Wardrobe Construction:

2.3.1 Workmanship: Form bends accurately. Cut edges straight and smooth. Holes shall be accurately punched or drilled and have all burrs removed. Extend butt welds the full width of joining edges; grind smooth and flush with adjacent surfaces when on exterior of wardrobes. Resistance welds shall be 3/16-inch minimum diameter and maximum spacing of 8 inches on center. Welds shall be thoroughly fused and sound and free from cracks, fissures, pits, holes, gas pockets, porosity, and under-cuttings. Leave no sharp corners or protrusions of any kind in the final assembled wardrobes. Use of mechanical fasteners exposed to exterior of unit shall be limited to those required for application of hardware and scribes.

2.3.2 Base shall be closed type, formed to provide a bearing surface at the floor, and provided with floor mounting holes. Bases constructed as part of the framing and panel members shall be of the same gauge as those members. Bases constructed as separate components shall be not lighter than 16-gauge steel.

2.3.3 Back and Side Panels shall each be formed of sheet steel not lighter than 22 gauge and shall be reinforced if necessary to impart rigidity to unbroken spans.

2.3.4 Front shall be not lighter than 18-gauge steel and multi-channel formed as required to provide strength and rigidity to side panels, top, and bottom without exposing fasteners. Front shall be reinforced as necessary to serve as a stable mount and frame for doors and hardware. Fronts formed as part of side panels shall be equivalent to the specified 18-gauge steel multi-channel construction. With the door closed, clearance between door edge and frame shall be uniform and shall not exceed 1/8 inch and door face shall be flush with the face of the front.

2.3.5 Top shall be not lighter than 22-gauge steel, flat exterior surface, and formed as required for securing to back, front and sides.

2.3.6 Bottom shall be not lighter than 18-gauge steel and formed as required for securing to back, front and sides.

2.3.7 Hat Shelf and Upper Storage Shelf shall be not lighter than 18-gauge steel and formed as required for securing to back and sides.

2.3.8 Doors shall be of double-wall type with not lighter than 22-gauge steel inside panel and not lighter than 20-gauge outside panel separated by not less than 3/4 inch of rigid mineral insulation cemented between the panels. Doors shall be reinforced or otherwise prepared for the reception of hardware and to provide strength and rigidity to the doors.

2.3.9 Scribes and Closures shall be not lighter than 20 gauge.

2.3.10 Chest Unit shall have top and side of not lighter than 20-gauge steel firmly attached to the wardrobe. Shelves shall be constructed of not lighter than 18-gauge steel. Drawer bodies shall be of not lighter than 22 gauge, and drawer fronts shall be of not lighter than 20 gauge with the top formed to provide a full length integral pull.



2.3.11 Finish shall be an approved factory-applied baked-enamel, semi-gloss finish in accordance with manufacturer's standard finishes. Color will be selected from manufacturer's standard colors.

2.4 Wood Wardrobe Construction:

2.4.1 General: Except as otherwise shown or specified, wood wardrobes shall conform to AWI-02 and AWI-01. Plywood for transparent finish shall be hardwood plywood, and one species shall be used throughout. Plywood for paint finish shall be hardwood plywood, or have a medium density impregnated fiber overlay.

2.4.2 Wood Scribes and Closures shall be 3/8-inch minimum thickness and shall match wardrobes. Moldings used in conjunction with scribes and closures and for joints between adjacent wardrobes shall be 5/16- by 1-1/16 inch flat members or 3/4-inch quarter round.

2.4.3 Wood Finishes: Interior surfaces shall be given an approved transparent finish, and exterior surfaces shall be given an approved paint finish of the color as selected from manufacturer's standard colors or an approved transparent finish. Surfaces to receive a transparent finish shall be stained to an approved shade and all wood surfaces to be finished shall be filled, sanded smooth, and given not less than two coats of an approved finish coating. Finishing of interior and exterior surfaces shall be part of a continuous shop operation to and including at least the first finish coat in order to minimize warping.

3.0 EXECUTION

3.1 Installation: Wardrobes shall be assembled and positioned in accordance with the layout shown, set level, and secured in place. Wardrobes with backs to walls shall be secured to the wall with not less than four fasteners, using one fastener near each corner. Free-standing or island-type installations shall be secured to the floor with not less than four fasteners, using one fastener near each corner. Back-to-back or side-to-side wardrobes shall be secured to each other. Securing of adjacent wardrobes shall be with three fasteners located high, low, and intermediate when a side is involved. Securing of adjacent wardrobes shall be with four fasteners located near the corners when a back-to-back installation is involved. Fasteners to secure metal wardrobes in place shall penetrate two thicknesses of metal at each wardrobe or shall be provided with washers. There shall be no sharp corners or protrusions in the final assembled wardrobes that could be considered harmful to the user or the stored items. Scribes over 14 inches wide shall be secured to the building construction with concealed fasteners at intervals not to exceed 12 inches on center. Hardware shall be adjusted and left in good working order. Doors and drawers shall not stick or bind, but shall operate smoothly and easily. Wardrobes shall be cleaned and protected from damage until acceptance.

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DIVISION 11 EQUIPMENT



SECTION 11024 VAULT DOOR UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vault door units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Vault Door Units: Vault door unit shall be an insulated, steel, flat-sill, record-vault-type door with frame and shall be a standard product of a manufacturer specializing in this type of construction. The Contractor shall furnish certificates certifying that the vault-door unit furnished under this specification conforms to the requirements of the Underwriters Laboratories. The label or listing of the Underwriters Laboratories, for fire-resistance classification and safety-relocking devices will be acceptable as sufficient evidence that the vault-door unit conforms to these requirements. In lieu of such label or listing, a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services may be submitted. The certificate shall state that the vault-door unit has been tested and that this unit conforms to the requirements listed herein, including methods of testing of the Underwriters Laboratories, Inc.

2.1.1 Doors: Design and construction of doors shall be manufacturer's standard and shall have a **UL 155** fire-resistant classification for a 4-hour exposure rating. Doors shall be of the size indicated. The finish for door, frame, and hardware shall be the manufacturer's standard for the type door indicated. Each door shall be equipped with a relocking device conforming to **UL 140**. The door shall be equipped with an inner escape device which will permit the bolt work to be released from inside the vault. Printed instructions for operating the escape device shall be provided inside the vault near the escape device release. There shall be not less than 5 bolts for the door. Each bolt shall be not less than 11/16 inch in diameter. When the bolts are not located on both jamb sides of the door, the jamb side not provided with bolts shall interlock with the frame walls of that side. Each door shall have not less than three heavy, offset roller bearing steel hinges.

2.1.2 Locks: Each door shall have a combination lock that complies with **UL 768**, Group 1R, for combination locks. The locking mechanism shall be operated by means of a lever handle. Locks shall be combination 3 tumbler, key or hand-changing type with a metal case, and shall be protected by a drill-resistive steel plate. The front-plate of the doors shall be not lighter than 0.060 inch steel plate either riveted or welded to the edge plates. Edge plates and back plates of doors shall be of not lighter than 0.032 inch steel.

2.1.3 Frame: The frame shall be of the tongue-and-groove interlocking type constructed of not lighter than 0.0478 inch cold-formed steel, formed from a single length for each jamb and a single length for the soffit. Soffit and jambs shall be continuously welded along the entire intersection. Sills shall be flat and not less in width than the jambs. Frame jambs and soffit shall be insulated with the same material as the door. The frame shall be designed for the thickness of vault wall indicated.

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2.1.4 Day Gate (Optional): The vault door unit may include a day gate of the manufacturer's standard make, and the door frame shall be designed to accommodate this day gate. The gate shall be of the swing-in, hinged type, and the gate frame shall be of not less than 3/8 inch by 1-1/4 inch aluminum or steel members. The day gate shall be equipped with a locking device arranged to permit locking and unlocking of the gate. Finish of the day gate shall be the manufacturer's standard. The day gate shall not interfere with the operation of the inner escape device.

2.2 Security Vault Door: Design and construction of the door and frame assembly shall conform to **FS AA-D-00600**. The door shall be Class 5, with desired opening swing and optional device features specified.

3.0 EXECUTION:

3.1 Installation: The vault door unit shall be installed in compliance with the approved installation instructions. If required, the day gate shall be installed in a manner that will not interfere with operation of the release handle on the inside of the vault door. After installation, the door, the locking mechanism, and the inner escape shall be adjusted for proper operation.



SECTION 11061 THEATER, AUDITORIUM SEATING

1.0 Description of Work: This specification covers the furnishing and installation of theater or auditorium upholstered seating with lifting seats. Products shall match existing materials or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.

PRODUCTS

2.1.1 Upholstered Self Lifting Seat: The seat component shall be upholstered and padded on its top surface and an injected molded plastic bottom, and shall automatically self lift to a three quarter fold position. Seat shall fold to a full folded position while occupant is standing. The seat shall be contoured to provide comfort. Pad topper shall have a 7/16 5 ply contour molded plywood foundation with molded polyurethane foam padding and fabric upholstered cover.

2.1.2 Hinge and Seat Lift Structure: Support structure shall be constructed of 12 gauge flanged steel. The seat structure shall rotate on two self compensating, fully independent 5/8 diameter high strength solid steel hinged rods. The seat shall be certified to withstand a 600 pound static load. The entire bottom cover shall be constructed of molded plastic. All upholstery workings shall be totally enclosed by the seat bottom cover.

2.1.3 Back Construction: Backs shall be padded and upholstered on their face with a one piece injected molded plastic rear panel. Structure of the back component shall be provided by a 7/16" thick 5 ply hardwood inner panel. The face of the rear pad shall be upholstered over 2 inch polyurethane foam pad. The outer panel shall be injected molded HDPE plastic, high impact resistant, with textured outer surface, formed to enclose the edges of the upholstered panel.

2.1.4 Seating Sizes: Varying lateral sizes of backs shall be used in accordance with approved seating plans, with standard in each row spaced laterally so that the end standards shall be in alignment from the first row to the last row whether aisles are constant width or convergence.

2.1.5 Armrest: Armrest shall be solid hardwood with all edges well rounded. Armrest shall be furnished with (2) keyhole slots in the bottom and shall lock securely to dove tail lugs provided on aisle and center standards.

2.1.6 Number/Letter Plates: A numbering system shall be provided for identification of all chairs. Number plate shall have a bronze finish and black letters. Numbers or letters shall be recessed into the seat. Aisle numbers/ letters shall be placed at the end of each aisle.

2.1.7 Tablet Arms (Optional): shall be provided for chairs as designated by the contract specification or drawings. Tablet arms shall be constructed of 5/8 thick resin-bonded particle board with decorative plastic laminate on the top surface and backer sheet on the bottom side for balanced construction. Tablet arms shall be designed to provide a strong stable work surface capable of supporting 320 lbs. in the center, and shall smoothly and quietly fold to a stored position parallel to and beneath the arm rest, when not use.

2.1.8 Fire Performance of Upholstered Seating: Shall meet Class 1 flammability requirements of the U.S. Department of Commerce Commercial Standard 191-53

2.1.9 Plastic Laminate: Plastic laminate shall be composed of a core of kraft papers, impregnated with phenolic resins, a decorated surface sheet, and overlay sheet containing melamine. Thickness for horizontal

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surfaces shall be .050, .030 for vertical. Color of plastic laminate shall be selected from the manufacturers standard color range. Molded plastic shall be one piece, high impact, linear polyethylene with built in burn rate of 1" per minute.

2.1.10 Wood: Plywood exposed or concealed shall be hardwood. All plywood's shall be hot pressed laminated. Interior plies shall be class 3 or better. Exposed exterior plies shall be class #1 continuous and selected as to color. All exposed hardwood veneer shall be maple or specified species. Particle core shall be 55 pound density. All exposed surfaces shall be stained to the color selected and coated with lacquer sufficient film depth to afford wear resistance of institutional quality.

2.1.11 Padding Material: Seat and back padding material shall be polyurethane foam. Padding material shall comply with the flammability requirements outline in California Technical Bulletin # 117, Resilient Cellular Materials section A&D, when tested in accordance with Federal Test Method 191.

2.1.12 Steel: All steel shall have smooth surfaces and be sufficient gauge thickness and designed to withstand strains of normal use and abuse. Exposed metal parts shall be powder coated with a hybrid powder coat finish.

2.1.13 ADA Requirements: Comply with Americans with Disabilities Act

2.1.14 Aisle Panel : Aisle panels shall be plastic laminate, hardwood veneer, or upholstered, as determine by the specifications. The aisle panel shall be high density particle core. Pedestal shall be constructed with 14 gauge steel with a formed panel of 16 gauge steel welded to the column. An 8" steel foot shall be welded to the column.

3.0 EXECUTION

3.1 Seating shall be installed in accordance with facility requirements, securely anchored in position and securely aligned vertically and horizontally.



SECTION 11106 REFRIGERATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential refrigerators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Refrigerators and Freezers: AHAM HRF-1.

2.2 Cords and Plugs: UL 62 and UL 817

2.3 General Electrical: NFPA 70 and 70B.

2.4 Compressors: UL 984.

2.5 Condensers: UL 250.

2.6 Motors: UL 73.

3.0 EXECUTION: (Section not used.)

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SECTION 11132 PROJECTION SCREENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of projection screens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Front-Projection Screens

2.1.1 Materials and Viewing Surface of Screens: Provide screens manufactured from mildew- and flame-resistant fabric with glass-beaded viewing surface and gain characteristics complying with FS GG-S-00172D(1) for Type C screen surface. Provide washable, glass-beaded viewing surface.

2.2.2 Fire-Test-Response-Characteristics: Provide projection-screen fabrics identical to materials that have been tested for flame resistance according to both small- and large-scale tests of NFPA 701.

2.2 Manually-Operated Screens: Provide manufacturer's standard spring-roller-operated units designed and fabricated for wall or ceiling installation and consisting of case, screen, mounting accessories, and other components necessary for a complete installation.

2.3 Electrically-Operated Screens: Provide manufacturer's standard UL-labeled units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Remotely control operation of each screen with single- or multiple-station controls.

3.0 EXECUTION:

3.1 Coordination: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.



SECTION 11150 PARKING CONTROL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing, installation, maintenance, and repair of parking control equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Aluminum: Contractor shall provide alloy and temper recommended by aluminum manufacturer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.

2.1.1 Extruded Aluminum: **ASTM B 221** (**ASTM B 221M**), 6063-T6.

2.1.2 Aluminum Sheet: **ASTM B 209** (**ASTM B 209M**), 5005-H15.

2.1.3 Aluminum Floor Plate: ASTM B 632/B 632M, 6061.

2.2 Cold-Rolled Steel Sheet: ASTM A 366/A 366M.

2.3 Galvanized Steel Floor Plate: ASTM A 786/A 786M, hot-dip galvanized according to ASTM A 123.

2.4 Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, **G90** (**Z275**) coating designation; commercial quality.

2.5 Steel Structural Tubing: ASTM A 500, cold-formed steel structural tubing, Grade B.

2.6 Steel Mechanical Tubing: ASTM A 513, welded steel mechanical tubing.

2.7 Hot-Dip Galvanized Mechanical Tubing: According to ASTM A 123.

2.8 Stainless-Steel Sheet: ASTM A 666, Type 302 or 304.

2.9 Plastic-Laminate Panels: NEMA LD 3, Type HWS, high-pressure decorative laminate, on **1/2-inch** (**12.7-mm**) thick particleboard.

2.10 Plywood Subfloors: Exterior classified plywood complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."

2.11 Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I (transparent glass, flat), Class 1 (clear).

2.12 Automatic Barrier Gates: The Contractor shall provide UL-approved, automatic, barrier-gate parking control system.

2.12.1 The Contractor shall fabricate cabinets of **0.0966-inch** (**2.5-mm**) thick steel sheet or **0.125-inch** (**3.2-mm**) sheet aluminum, internally reinforced. Weld seams and grind smooth. Provide weatherproof, gasketed access doors with flush-mounted locks; furnish two keys for each gate, keyed alike. Finish cabinet, interior and exterior, with manufacturer's standard white baked-enamel finish over primer system.

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2.12.2 The Contractor shall fabricate gate arm of lumber with **1-inch nominal (19-mm actual)** thickness, length as indicated. Finish with manufacturer's standard coating system with black diagonal stripes on traffic side face. Provide a mounting flange with breakaway feature to ensure a clean break if arm gets struck. Provide an automatic instant-reversing mechanism that stops downward motion of gate arm if arm strikes an object and that immediately returns arm to upward position. Include a 0- to 60-second variable-time reset device.

2.13 Vehicle Detectors:

2.13.1 Loop Detectors: The Contractor shall provide solid-state, electronic vehicle-detector units designed to detect presence or transit of a vehicle over an embedded loop of wire and emit an electrical pulse to operate other equipment. Provide a three-position sensitivity switch and detection indicator light on front panel.

2.13.2 Presence Detectors: The Contractor shall provide self-contained scanner detectors consisting of an infrared presence-sensing device to activate gate operator and a horizontal photoelectric beam to prevent gate from closing until traffic is clear. Detection patterns and sensitivity shall be adjustable.

2.14 Ticket Dispensers: The Contractor shall provide ticket dispenser units, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction, consisting of base cabinet and cap housing, ticket printing and issuing mechanism, ticket magazine, control panel, and electrical switches.

2.14.1 Cabinets: The Contractor shall provide base cabinet and cap housing fabricated of **0.0966-inch- (2.5-mm-)** thick steel sheet, reinforced internally with welded steel-angle framing. Weld seams and grind smooth.

2.14.2 Ticket Dispensing Mechanisms: Shall have removable assembly, with plug-in-type electrical connections for easy maintenance. Provide a self-sharpening ticket cutter. Before dispensing, ticket shall be imprinted with time and date.

2.15 Card Control Units: The Contractor shall provide pedestal-mounted card-control units to activate barrier gates. Fabricate housing of welded cold-rolled steel sheet with weatherproof access panel on front. Provide flush-mounted lock and two keys to operate access panel. Mount housing on a **2-inch- (50-mm-)** square, steel tube pedestal with a curved top to receive housing and a trim plate to cover anchor bolts. Finish units with manufacturer's standard baked-enamel coating system.

2.16 Clocks: The Contractor shall provide a cashier's clock for ticket dispenser at each exiting control location. Provide units that record time and date above same information printed by ticket dispenser; units shall record time in same manner as ticket dispenser. The clock case shall be fabricated of steel sheet and finish with manufacturer's standard coating system. Provide unit with an unbreakable crystal and a large, easy-to-read clock face.

2.17 Electronic Fee Computer: The Contractor shall provide manufacturer's standard electronic fee computer that will automatically calculate and display parking fees from ticket dispensed at entrance. Computer shall be programmable for at least six variable rates, and a permanent record of each transaction shall be registered in computer's memory.

2.18 Cashier's Booth: The Contractor shall provide manufacturer's standard, completely assembled, prefabricated cashier's booth, ready for installation on Project site. Booth generally consists of a structural frame and prefinished, insulated, wall and roof panels, sliding door, and operable windows. Provide built-



in cashier's work counter with storage drawer below. Equip booth with interior electric lighting, service outlets, and an electric heater.

2.18.1 Steel Booths: The Contractor shall provide manufacturer's standard steel cashier's booth with structural tubular steel frame and prefinished, insulated, galvanized steel sheet wall and roof panels.

2.18.2 Aluminum Booths: The Contractor shall provide manufacturer's standard aluminum cashier's booth with structural tubular aluminum frame and prefinished, insulated, aluminum sheet wall and roof panels; sliding door; and operable windows.

2.19 Accessories: The Contractor shall provide anchor bolts and other accessory items as required for installation and operation. Hot-dip galvanize anchor bolts and other accessory items according to ASTM A 153/A 153M.

3.0 EXECUTION:

3.1 Installation: Install parking control equipment according to manufacturer's written instructions and placement drawings. Unload cashier's booth with forklift or crane. Set booth level, plumb, and aligned. Cut groove in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to related equipment operated by detector.



SECTION 11160 PLATFORM AND DOCK LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Replacement Components:

2.1.1 Structural Components: All replacement parts of The equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.1.2 Hydraulic System Components: Pipe, tubing, fittings, and hydraulic hose shall be designed and constructed with a minimum safety factor of three based on bursting pressure. Cylinders, pumps, and control valves shall be designed to withstand test pressures of 150 percent of the design operating pressure.

2.1.3 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall not be less than one megohm.

2.2 Dock Lifts shall comply with ASME 14.1. The replacement lift shall have the same capacity, travel, minimum lowered level, and nominal raising and lowering speed as the existing lift.

2.3 Truck Levelers: The truck leveler shall have a capacity of 40,000 pounds. Leveler shall have a total travel of 36 inches, divided as follows: 18 inches up, 18 inches down.

3.0 EXECUTION:

3.1 Repair: Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.

3.2 Installation of Equipment: The equipment shall be installed by, or under the supervision of the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.



SECTION 11161 PLATFORM AND DOCK LEVELERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock levelers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Replacement Components:

2.1.1 General: Replacement components shall be new and of matching quality and construction. Every replacement part shall be made to definite standards, tolerances, and clearances and to fit in the existing equipment.

2.1.2 Structural Components: All replacement parts of the equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.1.3 Hydraulic System Components: The hydraulic system shall consist essentially of a hydraulic pump, hydraulic rams, pressure relief valve, fluid reservoir, hydraulic control valves including necessary continuous-duty solenoid valves and check valves, and connections. The system shall be installed as a separate and complete system in each platform unit.

2.1.4 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall be not less than 1 megohm.

2.2 Permanent, Self-Forming, and Free Standing Adjustable Dock Levelers: Levelers shall comply with DOC ASME MH14.1 for Class A loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.

2.3 Permanent Manually Operated Dockboards: Permanent manually operated dockboards shall comply with DOC ASME 14.1 for Class B loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.



SECTION 11165 PLATFORM AND DOCK BUMPERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock bumpers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Timber Bumpers shall be dense red oak. Ends shall be smooth and edges rounded to a radius of approximately 1/2 inch. All bolt holes shall be countersunk. Bumpers shall be treated in compliance with AWP A P5. Treating process and results shall comply with Fed. Spec. TT-W-571. Retention shall be a minimum of 0.23 pounds of oxide per cubic foot of treated wood.

2.2 Laminated Rubber Bumpers shall be resilient rubber material made from rubberized fabric truck tires cut to uniform size pads and punched to receive 3/4-inch supporting rods. The bumpers shall be closed with 3-inch by 2-1/2 inch by 1/4-inch structural steel angles under approximately 1,500 pounds of pressure. Angles shall be welded to 3/4-inch rods at one end and closed with threaded rod and nuts at the other end. Anchor leg of angle shall extend a minimum of 2-1/2 inches beyond rubber surface at either end and contain 2 or 3 anchor bolt holes.

2.3 Extruded Rubber Bumpers shall be manufactured of extruded ethylene propylene diene monomers (EPDM) hydrocarbon rubber of 70 durometer hardness or higher and with a minimum tensile strength of 2,400 psi. All mounting holes shall be countersunk.

3.0 EXECUTION:

3.1 Removal of Existing Bumpers: Remove existing bumpers in a manner to prevent damage to the surface on which they are mounted. All existing anchor bolts that have deteriorated or are not in proper position to facilitate mounting of new bumpers shall be cut off flush with the base surface. Existing bumpers that have been mounted by welding shall be removed by cutting torch and the resultant mounting surface power ground smooth and flush prior to installation of the new bumper.

3.2 Installation of New Bumper: All mounting hardware shall be new except existing expansion shields that are properly located and in suitable condition for reuse. Final installation shall be properly aligned, tight and flush against mounting surface.



SECTION 11402 FOOD SERVICE EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of food service equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Food service equipment shall comply with applicable NSF Standards. Gas-burning equipment shall be designed for operation with the type of gas designated and shall be approved by AGAL. Electrically operated equipment shall be in accordance with applicable standards of the UL Electrical Appliance and Utilization Equipment Directory and UL 197.

2.1 Equipment:

2.1.1 Vertical Steam Cooker: Mil. Spec. MIL-C-2354.

2.1.2 Commercial-Type Range: Gas, Fed. Spec. A-A-50064; electric, Fed. Spec. A-A-50035.

2.1.3 Ice Cube Machine: Mil. Spec. MIL-I-11867.

2.1.4 Rinser-Sanitizer: Mil. Spec. MIL-R-19038.

2.1.5 Fry Pan: Gas, ASTM F 1047; electric, ASTM F 1047.

2.1.6 Automatic Coffee Urn: Mil. Spec. MIL-U-43263.

2.1.7 Steam Kettles: Electric, Mil. Spec. MIL-K- 43359; gas, Mil. Spec. MIL-K- 43943.

2.1.8 Food Service Cabinets, Warmer-Refrigerator, Roll-Through, Roll-In: Mil. Spec. MIL-C-43427.

2.1.9 Convection Ovens: Gas, Fed. Spec. A-A-50042; electric, Fed. Spec. A-A- 50039.

2.1.10 Sanitizing Hot Water Heater: Mil. Spec. MIL-H-43895.

2.1.11 High Pressure Cleaning and Sanitizing Machines: Mil. Spec. MIL-C- 43949.

2.2 Materials:

2.2.1 Black Iron Pipe: ASTM A 53.

2.2.2 Brass Pipe: ASTM B 43, Class 1.

2.2.3 Chromium Plating of Brass Pipe, Valves, and Fittings: ASME A112.18.1M.

2.2.4 Copper Tubing: ASTM B 88, Type K or L, or ASTM B 75, as required.

2.2.5 Stainless Steel, Nonmagnetic: ASTM A 167 or ASTM A 240.

2.2.6 Stainless Steel Pipe and Tubing: Seamless or welded, of true roundness, and of material specified for stainless steel. Seamless tubing shall be thoroughly annealed, pickled, and ground smooth. Welded tubing shall be thoroughly heat-treated, quenched to eliminate carbide precipitation, and then drawn true to size, roundness, and ground. Tubing shall be given a No. 3 or 4 finish when exposed to view.

2.2.7 Fittings for Copper Tubing: Solder-joint type. Flared joint fittings may be used in specific applications when approved. Cast bronze solder joint fittings shall conform to ANSI B16.22. Wrought copper and wrought bronze solder joint fitting shall conform to ANSI B16.22. Cast bronze fittings for flared joints shall conform to ANSI B16.26.

2.2.8 Fittings for Brass Pipe: as required.

2.2.9 Galvanizing Repair Compound: ASTM D 520.

2.2.10 Silver Solder: Fed. Spec. QQ-B-654, class as applicable.

2.2.11 Steel Structural Shapes for Framing: ASTM A 36. Sections shall be galvanized by the hot-dip process, conforming to ASTM A 123, coating designation G-90.

2.2.12 Tin-Lead Solder: Fed. Spec. QQ-S-571, composition Sn50.

2.3 Garbage Disposal Machine: A floor supported type with cast alloy body supported on adjustable tubular legs. The upper housing shall be removable. The disposal shall be provided with a stainless steel cone with a water swirl inlet. Throat shall have a neoprene silver trap.

2.3.1 The Disposal shall be provided with magnetic starter with overload and under voltage protection, 5-minute timer, panel cover interlock, fused disconnect, prewired solenoid, vacuum breaker, water flow controls, positive flushing action and reversing action, or other positive means of preventing jamming. The rotor shall be cast alloy carrying rigid impact bars fixed directly onto motor shaft, or stainless steel swivel

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impellers and stainless steel undercutter. Disposal machines with a 5 hp or 7-1/2 hp motor shall have a minimum 8-inch diameter rotor.

2.3.2 Control: Control panel box shall be waterproof stainless steel construction.

2.4 Hoods: Design, fabrication, and installation of hoods and duct systems shall conform to NFPA 96 and UL 710 where applicable. Hood duct systems, grease removal devices, and cooking equipment, which may be a source of ignition of grease in the hood or duct, shall be protected with fixed pipe systems and provided with portable fire extinguishing equipment in accordance with NFPA 96, NFPA 17, and as specified. Ducts and hoods shall be secured to building so as to be level and free from vibration under all conditions of operations. Hoods, exposed ducts, and enclosures over dishwashing machines and rinse compartment of pot washing sinks shall be constructed of 18-gauge stainless steel. Hood shall be fabricated so as to form a condensate gutter at the perimeter and shall be provided with a condensate drain terminating at the floor sink location. Exhaust outlet shall be connected to the exhaust system.

2.5 Prefabricated Walk-In Refrigerators: Commercial, walk-in type, intended for use in dining facilities, in accordance with UL 207, UL 471, and NSF Std 7 except insulation shall provide a maximum "U" factor of 0.0295 Btuh.

2.6 Gas Burning Equipment shall comply with the applicable requirements of AGAL and ANSI. Each gas-burning appliance shall be connected to the building piping by means of a quick-disconnect device and flexible connector. A manual shutoff valve shall be installed on the building piping, ahead of the supply side of each quick-disconnect device. The quick-disconnect device shall conform to ANSI Z21.41 and the flexible connector to ANSI Z21.45. The length of the flexible connector shall be as required but shall not exceed 72 inches. Flexible connector shall not be concealed and shall not extend from one room to another. Dust caps and plugs shall be provided for quick-disconnect fittings for use when fittings are uncoupled.

2.7 Backflow Preventers: Each item of food service equipment having water supply and waste connections, with the water inlet connected below the flood level of the equipment, shall be supplied with backflow preventer of size and proportions that will allow an ample flow of water to the equipment, but will prevent the backflow of waste or polluted water into the water supply system.

2.8 Paint shall be of a durable, nontoxic, nondusting, nonflaking, and mildew-resistant type, suitable for use with food service equipment and in conformance with NSF 2.

3.0 EXECUTION:

3.1 Installation: Equipment shall be installed in accordance with NSF Installation Manual for Food Service Equipment. The Contractor shall make provision for the plumbing, heating, and electrical connections and for equipment indicated as being furnished and installed by the Government. Equipment connections shall be complete to wall or floor for all utilities. Unless otherwise specified, exposed piping shall be chromium-plated copper alloy or stainless steel. Gas equipment installation shall conform to ANSI Z21.15 and NFPA 54. Electrical work shall comply with NFPA 70.

3.2 Painting: All exterior, galvanized parts, exposed members of framework, and wrought steel pipe, where specified to be painted, shall be cleaned, degreased, primed with rust inhibiting primer, and finished with two coats of epoxy-based grey hammertone paint.



SECTION 11415 UNIT KITCHENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of unit kitchens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Electrical components shall comply with applicable UL standards and bear appropriate UL labels. Gas-burning equipment shall comply with ANSI Z21.1 and shall bear the AGA seal of approval.

2.1 Materials: Minimum 22-gauge steel sheet for component body parts, minimum 20-gauge steel sheet for door fronts and liners, and heavier-gauge steel for internal gussets and bracing.

2.1.1 Steel Sheet: ASTM A 366/A 366M, exposed, matte finish, cold-rolled carbon-steel sheet.

2.1.2 Steel Sheet for Porcelain Enameling: ASTM A 424, commercial quality, cold-rolled carbon-steel sheet.

2.1.3 Stainless-Steel Sheet: ASTM A 666, Type 304.

2.1.4 Particleboard: ANSI A208.1, Grade M-2.

2.1.5 Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.1.6 Solid Wood: Clear hardwood lumber of species indicated, free of defects, selected for compatible grain and color, and kiln dried to 7 percent moisture content.

2.1.7 Vinyl-Faced Fiberboard: Medium-density fiberboard complying with ANSI A208.2, milled to required shapes, with thermoformed vinyl overlay applied in a vacuum or membrane press.

2.1.8 High-Pressure Decorative Laminate: NEMA LD 3.

2.1.9 Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, Type 5 or Type 6, without pre-coated finish.

2.2 Components: Electrical components shall be wired for the voltage available and shall terminate at factory-installed terminal boxes. Gas-burning components shall be designed to operate on the designated fuel. Unit kitchens shall include the following, as required:

2.2.1 Top and Sink shall be seamless, one-piece with integral back and end splashes fabricated from 18-gauge AISI Type 302/304 stainless steel with No. 4 brushed finish or 16-gauge minimum titanium steel with acid-resistant porcelain finish. Sink accessories shall include chrome-plated swing spout faucet with aerator, chrome-plated faucet handles, stainless steel cup strainer, and drain outlet with tailpiece.

2.2.2 Food Waste Disposer shall be continuous-feed-type food-waste disposer, minimum 1/2 hp, overload protected and wall-switch operated; corrosion-resistant construction, with quick-mounting feature, stainless-steel sink flange, cushioned suspension, stainless-steel grinding chamber, jam-resistant cutting/shredding mechanism, anti-splash guard, combination cover/stopper, drain outlet and tailpiece.

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2.2.3 Refrigerator and Freezer Compartments shall be the designated minimum capacity measured in accordance with AHAM HRF-1. The refrigerator shall be furnished with an automatic icemaker.

2.2.4 Range: Each cook-top burner shall be rated at not less than 1,250 watts, if electric, or 8,000 Btu, if gas.

2.2.5 Oven: Electric oven "Bake" operation shall be rated at 2,000 watts minimum and "Broil" operation shall be rated at 2,500 watts minimum; gas oven burners shall be rated at 18,000 Btu minimum.

2.2.6 Microwave Oven: Minimum **0.6-cu. ft. (0.017-cu. m)** capacity, minimum 600 W, complete with variable power control, timer, tempered glass door, start-stop switches, and interior light.

2.2.7 Dishwasher: Built-in under counter unit, with multiple wash cycles, roll-out coated racks, and insulated cavity walls and door.

2.2.8 Automatic Coffeemaker: Stainless steel, permanently installed on countertop. Provide glass coffee decanters in number to match capacity.

2.2.9 Ventilating Exhaust Hood: Under-cabinet mounted, **24 inches (610 mm)** wide, with 2-speed fan, permanent washable filter, and built-in lighting. Include exhaust duct and wall or roof cap and shutter

2.2.10 Cabinets shall be under-counter and upper wall-mounted, with shelves, doors, drawers, and hardware.

3.0 EXECUTION:

3.1 Installation: Comply with unit kitchen manufacturer's written installation instructions, unless more stringent requirements are indicated.

3.1.1 Anchorage: Securely anchor components and appliances to supporting cabinets or countertops with concealed fasteners. Securely anchor unit kitchens to adjacent walls and floor with concealed devices.

3.1.2 Clearances: Verify that clearances are adequate to properly and freely operate appliances.

3.1.3 Connections: Connect unit kitchens to plumbing, mechanical, and electrical systems.



SECTION 11420 RANGES AND OVENS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential ranges and ovens. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conduit: UL 1.

2.2 Conductors: UL 62, UL 83, and UL 817.

2.3 Switches: UL 20 and UL 917.

2.4 Fuses and Fuseholders: UL 198 and UL 512.

2.5 Connectors: UL 486.

2.6 Ranges: UL 858.

2.7 Thermal Cutoffs: UL 1020.

2.8 General Electrical: NFPA 70 and 70B.

2.9 Pilot Lights: UL 496 and UL 542.

2.10 Range Hoods: Non-vented, two-speed fan, charcoal filter, light, UL listed.

3.0 EXECUTION: (Section not used.)

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SECTION 11484 GYMNASIUM EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Basketball Backstops shall be ceiling-suspended forward-folding, backward-folding, side-folding, wall-braced or fixed type; wall-mounted up-folding, side-folding or fixed type; or floor-mounted portable type as required. Backstop shall come complete with backboard, goal, and all accessories. Backboard material shall be glass, fiberglass, steel or wood as required and rectangular or fan shaped. Movable backstops shall be manually or electrically operated. Backstops, goals, and their accessories shall meet the specifications of the National Collegiate Athletic Association.

2.2 Telescoping Bleachers shall be operable bleacher systems of multiple-tired benches on interconnected folding supports, which permit closing, without requiring being dismantled, into a nested relationship for purposes of storing or moving. The bleachers shall be wall-attached, free-standing floor-attached, or free-standing movable type as required. The bleachers shall conform to the applicable requirements of Chapter 5 of NFPA 102. Bleacher seats shall be wood, vinyl-clad steel, or plastic, as required. System shall have row rise and row spacing as desired and shall come complete with end panels, rear fillers, back panels, end railings and back railings as required. Bleachers shall be manually or electrically operated.

2.3 Gym Divider Curtains shall be constructed of vinyl for the first eight feet (8' 0") above the floor. The remainder shall be 1-3/4 inch mesh, white nylon netting. A chain or other ballast shall be sewn into the bottom hem. Curtains that are drawn shall be manually operated and glide along their own track. Roll-up curtains shall be power-operated.

3.0 EXECUTION:

3.1 Basketball Goals shall be securely attached to supporting construction and shall be installed at a height of 10 feet from the rim to the floor.

3.2 Telescoping Bleacher Seating: Verify that areas to receive telescoping bleacher seating are free of impediments interfering with installation and operation. Securely attach to supporting construction.

3.3 Gym Divider Curtains: Verify that areas to receive gym divider curtains are free from interferences and structurally capable of supporting the curtains.



SECTION 11486 DEMOUNTABLE BLEACHERS (EXTERIOR)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Hardware and Accessories shall be zinc-coated or hot-dipped galvanized steel or aluminum.

2.2 Lumber used for seat-board and foot-board repair or replacement shall be species and grades complying with National Forest Products Association National Design Specification for Wood Construction and Its Fastenings. Sizes shall comply with American Lumber Standards Committee PS20. Lumber materials shall bear the mark of a recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.

2.2.1 Seat-board Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.

2.2.2 Foot-board Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.

2.3 Steel Structural Members shall comply with ASTM A 36.

2.4 Aluminum Structural Members shall comply with ASTM B 308.

3.0 EXECUTION: Repair or replace bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction Timber Construction Manual.

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SECTION 11498 FIXED WOOD BLEACHERS (EXTERIOR)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fixed wood bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Hardware, Brackets, Fasteners, and Connectors shall be zinc-coated or hot-dipped galvanized steel or aluminum. Nails, brads, staples, and spikes shall comply with ASTM F 547.

2.2 Lumber and Timber Members used for repair or replacement of bleacher components shall be of the species and grades complying with National Design Specification for Wood Construction and its Fastenings (National Forest Products Association). Sizes shall comply with American Lumber Standards Committee PS20. Lumber materials shall bear a mark of recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.

2.2.1 Seatboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow pine boards.

2.2.2 Footboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow Southern pine boards.

2.2.3 Support Member and Timber shall be Dense No. 1 Douglas fir or Dense No. 1 yellow pine timbers or boards.

2.3 Ready-Mixed Concrete shall comply with ASTM C 94 with compressive strength of 3,000 pounds per square inch (210.9 kgs per square cm) at 28 days and shall be protected from freezing for seven days after placement.

2.4 Reinforcement for Concrete shall comply with ASTM A 184, A 185, or A 615 as indicated.

3.0 **EXECUTION:** Repair or replace wooden bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction Timber Construction Manual.



SECTION 11501 PAINT SPRAY BOOTH

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of paint spray booths. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of paint spray booth protection.

2.0 PRODUCTS: All products shall meet applicable OSHA and NFPA standards.

2.1 Enclosure:

2.1.1 Panels: 18 gauge, ASTM A 568.

2.1.2 Stiffeners and Support Shapes: ASTM A 36.

2.1.3 Exhaust Chamber: 18 gauge, formed to hold filters.

2.1.4 Doors:

2.1.4.1 Access Door: 2 feet 6 inches by 7 feet 0 inches, steel-clad.

2.1.4.2 Entrance Doors for Vehicular Booths: Swing type, two-section, steel-framed with intake air filters, a minimum opening of 8 feet 9 inches in height by 9 feet 10 inches in width, leak-proof seals and a heavy-duty latch.

2.1.4.3 Exit Doors for Vehicular Drive-Through Booths: Swing type, two-section, steel frame, metal-clad, solid, with a minimum opening of 7 feet 9 inches in height by 9 feet 10 inches in width, leak-proof seals, and a heavy-duty latch.

2.1.5 Factory Finish: Galvanized or painted.

2.2 Filtering Equipment:

2.2.1 Arrestor: Disposable, expanded fiber or fiberglass, Class 2 listed by UL.

2.2.2 Water Wash: Complete with pumps, spray nozzles, baffles, and controls.

2.3 Exhaust Fans shall be sized to maintain 100 fpm minimum across the cross sectional area of booth and shall have permanently lubricated bearings and enclosed belts. Fan motors shall be located outside of air stream.

2.4 Lighting: Fluorescent.

2.5 Fans, Controls, and Lights inside Paint Booths shall be explosion proof.

3.0 EXECUTION: Installation shall comply with applicable codes and environmental regulations.

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SECTION 11600 METAL MEDICAL CASEWORK

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal medical casework. Products shall match existing and/or be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Steel Sheet: ASTM A 366 (ASTM A 366M), matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness. For enamel-steel medical casework, provide components of the following thickness:

2.1.1 Sides, ends, fixed backs, bottoms, cabinet tops, soffits, and items not otherwise indicated: 0.0478 inch (1.2 mm).

2.1.2 Back panels, doors, drawer fronts and bodies, and shelves: 0.0359 inch (0.9mm). For shelves more than 36 inches (900 mm) long, use 0.0478-inch- (1.2-mm-) thick metal or provide suitable reinforcement.

2.1.3 Intermediate horizontal rails, center posts, and top gussets: 0.0598 inch (1.5 mm).

2.1.4 Drawer runners and hinge reinforcements: 0.0747 inch (1.9 mm).

2.1.5 Leveling and corner gussets: 0.1046 inch (2.7 mm).

2.2 Stainless Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness. For enamel-steel medical casework, provide components of the following thickness:

2.2.1 Sides, ends, fixed backs, bottoms, cabinet tops, soffits, and items not otherwise indicated: 0.0500 inch (1.3 mm).

2.2.2 Back panels, doors, drawer fronts and bodies, and shelves: 0.0375 inch (0.95 mm). For shelves more than 36 inches (900 mm) long, use 0.0500-inch- (1.3-mm-) thick metal or provide suitable reinforcement.

2.2.3 Intermediate horizontal rails, center posts, tubular legs, and top gussets: 0.0625 inch (1.6 mm).

2.2.4 Drawer runners and hinge reinforcements: 0.0781 inch (2.0 mm).

2.2.5 Leveling and corner gussets: 0.1094 inch (2.8 mm).

2.3 Clear Float Glass: ASTM C 1036, Type I, Class 1.

2.4 Clear Tempered Glass: ASTM C 1038, Kind FT, Condition A, Type I, Class 1.

2.5 Laminated Safety Glass: ASTM C 1172, Kind LT, Condition A, Type I, Class I.

2.6 Fabrication: The Contractor shall complete assembly and finish work at point of manufacture. Perform assembly on precision jigs to provide units that are square; fully reinforced with angles, gussets, and channels; and integrally framed and welded to form a dirt- and vermin-retardant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).



2.7 Finishes:

2.7.1 Enamel-Steel: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, chemical-resistant, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of **1 mil (0.025 mm)** for topcoat and **2 mils (0.05 mm)** for system.

2.7.2 Stainless Steel: Grind and polish surfaces to produce uniform, directional, textured, polished finish free of cross scratches and matching No. 4 finish.

2.8 Casework Hardware: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

2.9 Countertops, Sinks, and Shelving:

2.9.1 Stainless Steel Tops: Made from **0.0625-inch- (1.6-mm-)** thick, stainless-steel sheet, ASTM A 666, Type 304 with No. 4 satin finish.

2.9.2 Stainless Steel Sinks: Made from **0.050-inch- (1.27-mm-)** thick, stainless-steel sheet, ASTM A 666, Type 304. Fabricate with corners rounded and coved to at least **5/8-inch (16-mm)** radius. Slope sink bottoms to outlet. Provide double-wall construction for sink partitions with top edge rounded to at least **1/2-inch (13-mm)** diameter. Provide continuous butt-welded joints, grind smooth, and polish surfaces to produce finish indicated, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.9.3 Stainless Steel Shelving: Shelves made from **0.050-inch- (1.27-mm-)** thick, stainless-steel sheet, ASTM A 666, Type 304 with No. 4 satin finish. Fold down front edge **3/4 inch (19 mm)** and hem; turn up back edge **3 inches (76 mm)**. Provide integral stiffening brackets, formed by folding up ends and welding to upturned back edge. Weld shop-made joints, grind smooth, and finish.

3.0 EXECUTION:

3.1 Casework Installation:

3.1.1 Install level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.1.2 Installation of Countertops (Field Jointing): Provide flush welded joints in tops. Grind and polish surfaces to produce uniform, directional, textured, polished finish indicated, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.



SECTION 11700 LABORATORY AND MEDICAL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laboratory and medical equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Materials: Materials, unless otherwise specified, shall conform to the following:

2.1.1 Carbon Steel: ASTM A 36/36M, ASTM A 285/285M, ASTM A 515/515M, or ASTM A 366/366M.

2.1.2 Chromium Clad Steel: ASTM A 263.

2.1.3 Nickel: ASTM B 39.

2.1.4 Nickel and Nickel-Alloy Cladded Steel for Pressure Vessels: ASTM A 265.

2.1.6 Stainless Steel: ASTM A 167, Type 301, 302, 304, or 316L.

2.1.7 Stainless Steel Bars and Rods: ASTM B 166.

2.1.8 Stainless Steel for Pressure Vessels: ASTM A 240/240M.

2.1.9 Stainless Steel Clad for Pressure Vessels: ASTM A 264.

2.1.10 Tin: ASTM B 339.

2.1.11 Titanium: For construction products used in contact with distilled water, ASTM B 348, Grade 2.

2.2 Piping and Tubing: Piping and tubing shall conform to the following:

2.2.1 Copper Pipe for Steam and Condensate Lines: ASTM B 42.

2.2.2 Brass Pipe for Steam and Condensate Lines: ASTM B 43.

2.2.3 Brass Pipe for Gaseous Sterilant Lines: ASTM B 43, Alloy 230.

2.2.4 Brass Tube for Steam and Condensate Lines: ASTM B 135, Alloy 230.

2.2.5 Copper Tube for Water and Waste Lines: ASTM B 88.

2.2.6 Brass Tube for Water and Waste Lines: ASTM B 135, Alloy 230.

2.2.7 Stainless Steel Tube for Gaseous Sterilant Lines: ASTM A 269, ASTM A 312/312M, or ASTM B 167, as applicable.



2.3 Equipment Supports: The Contractor shall furnish equipment supports such as stands, brackets, hangers, and similar supports for equipment and accessories, including pipe, duct, and conduit specified in this section. Floor stands shall be field adjustable for leveling.

2.4 Electrical Work: Electric motor-driven equipment shall be provided complete with motors, motor starters, and controls. Electrical equipment and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as specified herein or indicated. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified shall be provided.

2.5 Compliance: The label or listing of the Underwriters Laboratories, will be accepted as evidence that the equipment conforms to the standard. In lieu of this label or listing, the manufacturer may submit a statement from a nationally recognized, equally equipped testing agency indicating that items have been tested in accordance with specification requirements.

2.5.1 Standard Products: Material and equipment shall be the standard product of manufacturers regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.5.2 Nameplates: Each major item of equipment shall have the manufacturer's name, address, and catalog or serial number permanently affixed to a plate securely attached to the equipment. In addition, each pressure vessel shall bear the ASME stamp and pressure rating, indicating compliance with applicable code requirements.

2.5.3 Verification of Dimensions: The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

2.5.4 Equipment Guards: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or properly guarded.

2.5.5 Sanitary Safeguard: Protection against backflow and siphonage shall be provided in accordance with NAPHCC-01.

2.6 Equipment Finishes: Exposed carbon steel surfaces of equipment shall be protected by manufacturer's standard finish. Unless otherwise specified, exposed stainless steel surfaces of all equipment shall have satin No. 3 or No. 4 finish unless otherwise approved.

3.0 EXECUTION:

3.1 Installation: Equipment shall be installed at locations indicated in accordance with manufacturer's printed installation instructions and approved detail drawings. Necessary items such as framing, mounting hardware and trim shall be furnished and installed as required for the type of equipment furnished.

3.2 Adjusting: Following installation, flows, timers, levelers, and similar components and operation devices shall be adjusted as appropriate. After testing, and before acceptance, equipment shall be examined to ensure that adjustments are correct and that any additional adjustments deemed necessary during product testing or because of timing, have been incorporated.

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3.3 Utilities:

3.3.1 Service runs from equipment shall be connected to building services as indicated.

3.3.2 Connections between ferrous and nonferrous metallic pipe shall be made with dielectric unions or flanges using dielectric material.

3.3.3 Steam lines on equipment for connection to building source shall be connected only after building steam lines have been cleaned of preservatives and materials that may be harmful to the equipment.

3.3.4 Distillate coolers or other protective devices shall be installed as necessary to protect high temperature discharge to waste.

3.4 Testing: Testing shall be performed in accordance with referenced specifications and/or requirements specified . One item or similar model, as necessary or appropriate, shall be tested to ensure that it is operational and installation conforms to specification requirements. Manufacturer's standard equipment warranty shall not begin until the manufacturer certifies equipment conformance to all required testing specified and until beneficial occupancy of the portion of the facility where the equipment is installed.

3.5 Field Services and Training: The Contractor shall provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment. The Contractor shall also conduct training course for operation staff as designated by the Contracting Officer. The training period shall start after systems are functionally complete but prior to final acceptance . The field instructions shall cover all of the items contained in the operations and maintenance instructions, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to date of proposed conduction of training course.



SECTION 11910 DISHWASHERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential dishwashers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Dishwashers: UL 749.

2.2 Time Control: UL 917.

2.3 Control Valves: UL 429.

2.4 General Electrical: NFPA 70 and 70B.

2.5 Cords and Plugs: UL 62.

2.6 Motors: UL 73 and UL 547.

2.7 Safety-Interlock Switch: UL 749.

3.0 EXECUTION: (Section not used.)

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SECTION 11912 GARBAGE DISPOSERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential garbage disposers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Household Garbage Disposal: AHAM FWD-1.

2.2 Cords and Plugs: UL 62 and UL 817.

2.3 Motors: UL 73.

2.4 General Electrical: NFPA 70 and 70B.

3.0 EXECUTION: (Section not used.)



SECTION 11920 CLOTHES DRYERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes dryers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cords and Plugs: UL 62 and UL 817.

2.2 Thermal Cutoffs: UL 1020.

2.3 General Electrical: NFPA 70.

2.4 Motors: UL 73.

2.5 Home Laundry Equipment: UL 560.

2.6 Switches: UL 917 and UL 20.

2.7 Lamps and Lamp Holders: UL 496 and UL 542.

2.8 Vent Duct: Plastic wrapped, flexible wire duct of diameter to fit duct pipe of machine.

2.9 Weather Hood: Aluminum construction with backdraft damper.

3.0 EXECUTION: (Section not used.)

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SECTION 11922 CLOTHES WASHERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes washers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Cords and Plugs: UL 62 and UL 817.

2.2 Electrically-Operated Valves: UL 429.

2.3 Home Laundry Equipment: UL 560.

2.4 Lamps and Lamp Holders: UL 496 and UL 542.

2.5 General Electrical: NFPA 70.

3.0 EXECUTION: (Section not used.)



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DIVISION 12 FURNISHINGS



SECTION 12531 WINDOW TREATMENT HARDWARE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of curtain and drapery hardware. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's written recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: For each type of curtain or drapery hardware specified, Include the maximum weight of window treatment that can be operated by hardware, and installation and maintenance instructions.

2.2 Aluminum: Products shall be Anodized Aluminum Alloy with a minimum thickness of 0.047 inches with baked on enamel paint finish.

2.3 Steel: Products shall be phosphate treated steel with a minimum thickness of 0.027 inches with baked on enamel paint finish.

2.4 Wood, Ribbed Wood, Plastic and Acrylic: Products shall meet or exceed requirements of NFPA 701.

3.0 EXECUTION:

3.1 Hardware Installation:

3.1.1 Engage an experienced contractor who has completed window treatment hardware installations similar in material, design, and extent to those indicated for this project and with a record of successful in-service performance.

3.1.2 Installation shall be in accordance with the manufacturer's written installation instructions. Units shall be level, plumb, secure, and at proper height and location relative to window units.

3.1.3 The contractor shall furnish and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation.

3.1.4 Isolate metal parts of the window treatment hardware from concrete or mortar to prevent galvanic action. Use tape, thickened coatings, or another manufacture recommended method.

3.1.5 Installation shall not be initiated until completion of room painting and finishing operations. Upon completion of the installation, window hardware shall be adjusted for form and appearance, shall be in proper operating condition, and shall be free from damage or blemishes. Damaged units shall be repaired or replaced by the contractor as directed by the contracting officers.



SECTION 12500 WINDOW TREATMENT

PART I. GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

FEDERAL SPECIFICATIONS (FS)

FS AA-V-00200 (Rev B) Venetian Blinds

NATIONAL FIRE PROTECTION (NFPA)

NFPA 701 (1996) Methods of Fire Test for Flame-Resistant Textiles and Films

1.2 GENERAL

Window treatment shall be provided, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Equipment shall be mounted and operated as indicated. Windows to receive a treatment shall be completely covered. The Contractor shall take measurements at the building and shall be responsible for the proper fitting and hanging of the equipment.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted:

SD-01 Data

Window Treatments and Hardware; FIO

Manufacturer's data composed of catalog cuts, brochures, product information, and maintenance instructions.

SD-04 Drawings

Window Treatments and Hardware; FIO

Drawings showing fabrication and installation details. Drawings shall show layout and locations of track, direction of draw, mounting heights, and details.

SD-14 Samples

Window Treatments and Hardware; GA



Three samples of each type and color of window treatment. Blind slats or louvers shall be 150 mm (6 inches) in length for each color

1.4 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Components shall be stored in a dry location that is adequately ventilated and free from dust, water, or other contaminants and shall have easy access for inspection and handling. Materials shall be stored flat in a clean dry area with temperature maintained above 10 degrees C.

1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and shall advise the Contracting Officer's representative of any discrepancy before performing the work.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 WINDOW BLINDS

Each blind, including hardware, accessory items, mounting brackets and fastenings, shall be provided as a complete unit produced by one manufacturer. All parts shall be one color unless otherwise shown, and match the color of the blind slat. Steel features shall be treated for corrosion resistance.

2.1.1 Horizontal Blinds

Horizontal blinds shall conform to FS AA-V-00200, Type II (25.4 mm or 1 inch) slats. Blind units shall be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds shall be inside mount as shown. Tapes for Type I slats shall be longitudinal reinforced vinyl plastic in 1-piece turn ladder construction.

2.1.1.1 Head Channel and Slats

Head channel shall be steel or aluminum. Slats shall be aluminum, not less than 0.008 inch thick, and of sufficient strength to prevent sag or bow in the finished blind. A sufficient amount of slats shall be provided to assure proper control, uniform spacing, and adequate overlap.

2.1.1.2 Controls

The slats shall be tilted by a transparent tilting wand, hung vertically by its own weight, and shall swivel for easy operation. The tilter control shall be of enclosed construction. Moving parts and mechanical drive shall be made of compatible materials which do not require lubrication during normal expected life. The tilter shall tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. A mechanism shall be included to prevent over tightening. The wand shall be of sufficient length to reach to within 1500 mm (5 feet) of the floor.



2.1.1.3 Intermediate Brackets

Intermediate brackets shall be provided for installation of blinds over 1200mm (48 inches) wide and shall be installed as recommended by the manufacturer.

2.1.1.4 Hold-Down Brackets

Universal type hold-down brackets for sill or jamb mount shall be provided.

2.1.2 Vertical Blinds

Vertical blind units shall be capable of nominally 180 degree partial tilting operation and full stackback. The blinds shall be listed by the manufacturer as designed for heavy duty strength applications including heavy duty hardware. Vertical blinds shall be mounted with inside brackets. Blinds shall be sill length. Outside mount type installation shall provide adequate overlap to control light and privacy.

2.1.2.1 Louvers

Solid vinyl louvers shall be fire resistant, UV stable, impact resistant, and shall not emit corrosive fumes in a fire. Louvers shall hang without a bottom chain. Groovers shall be extruded from solid vinyl with clear non-yellowing channel lips to accept fabric inserts. Fabric inserts shall be flame retardant and colorfast. 3-1/2 inch louvers shall overlap not less than 10 mm (3/8 inch) and shall be dimensionally stable.

2.1.2.2 Carriers

Carriers shall be provided to support each louver. Carriers shall be of molded plastic and shall transverse on self-fabricated wheels for smooth, easy operation. The hook of the carrier shall have an automatic latch to permit easy installation and removing of the louver, and shall securely lock the louver for tilting and traversing.

2.1.2.3 Headrail System

Headrail system shall be not less than 1.19 mm (~0.047 inch) thickness and shall be made of anodized aluminum alloy or 0.635 mm (0.027 inch) thick phosphate treated steel with a baked on ivory gloss enamel paint finish. The headrail shall extend the full width of the blind and each end shall be closed with an end cap. One cap shall contain the traversing and tilting controls. The opposite cap shall house the pulley for the traversing cord.

2.1.2.4 Valance

Manufacturers standard valance shall be attached to the headrail by metal or plastic holders which grip the top and bottom edge of the valance and shall accept an insert of the same material as the slats. There shall be sufficient clearance behind the valance to permit the louvers to tilt without interference. The headrail cover shall extend the full width of the blind. Returns shall be formed of a single piece where the end of the head is visible.

2.1.2.5 Controls

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Tilting control and traversing controls shall hang compactly at side of the blinds and shall reach within 1500 mm (5 feet) of the floor. The tilt/traverse control baton shall tilt all vanes simultaneously to any desired angle and hold them at that angle. The louvers shall traverse one way (either left or right). The traversing control cord shall be minimum 1.78 mm (0.070 inch) in diameter with a minimum breaking strength of 556 N. (125 pounds). The cord shall be anchored to a lead carrier which shall be linked to all adjacent carriers. The louvers shall be traversed along the headrail by pulling one side of the looped cord. A weighted pulley shall be provided at the bottom of the cord or a fiberglass wand shall tilt the louvers by turning the wand and shall traverse the louvers by using the wand as a drapery baton.

2.1.2.6 Connectors and Spacers

The connector shall be flexible, smooth and flat to slide unhindered when carriers move independently of each other, and to nest compactly when carriers are stacking. The length of the links shall relate to the louver width in order to equally space the traversing louvers, to maintain uniform and adequate overlap of louvers, and to fully cover the width of the opening.

2.1.2.7 Intermediate Brackets

Intermediate installation brackets shall be furnished for blinds over 1575 mm (62 inches) wide.

2.3 COLOR

Color shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 WINDOW TREATMENT PLACEMENT SCHEDULE

Window covering shall be provided as indicated on the drawings.

3.2 INSTALLATION

Installation shall be in accordance with the approved detail drawings and manufacturer's installation instructions. Units shall be level, plumb, secure, and at proper height and location relative to window units. The Contractor shall furnish and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Installation shall not be initiated until completion of room painting and finishing operations. Upon completion of the installation, window treatments shall be adjusted for form and appearance, shall be in proper operating condition, and shall be free from damage or blemishes. Damaged units shall be repaired or replaced by the Contractor as directed by the Contracting Officer's representative.

--End of Section--



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DIVISION 13 SPECIAL CONSTRUCTION



SECTION 13090 RADIATION PROTECTION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of radiation protection shielding. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Radiation protection shielding shall be the design and product of a firm experienced in manufacturing products similar to those indicated and with a record of successful in-service performance. Obtain each type of radiation protection product through one source from a single manufacturer.

2.1 Materials:

2.1.1 Lead Sheet: FS QQ-L-201, Grade C, or ASTM B 749, alloy UNS No. L51120 (chemical lead).

2.1.2 Lead Bricks: Interlocking cast- or extruded-lead bricks made from pig lead, complying with ASTM B 29 with 1/2 percent antimony added, with tongues on one edge and end and grooves on one edge and end.

2.1.3 Borated Polyethylene: Manufactured specifically for neutron shielding and containing not less than 5 percent boron.

2.1.4 Lead Glass: Lead-barium, polished plate glass containing more than 60 percent heavy metal oxide, including 55 percent lead oxide by weight.

2.1.5 Lead Glazing Plastic: Transparent acrylic sheet impregnated with an organolead compound and containing 30 percent lead by weight.

2.1.6 Lead-Lined Concrete Masonry Units: Fabricated from 2 solid concrete units, complying with ASTM C 90 or ASTM C 129, separated vertically by a single lead sheet permanently bonded or anchored between the 2 halves. Size lead sheets to provide a **1-inch** overlap with adjacent units or provide supplemental lead to ensure uninterrupted protection.

2.1.7 Masonry Mortar: Comply with ASTM C 270, Type N, Proportion Specification.

2.1.8 Lead-Lined Plywood Panels: Panels complying with HPVA HP-1, at least **1/2 inch** thick, with a single lead sheet laminated to the back of the panel.

2.1.9 Lead-Lined Gypsum Lath: Gypsum lath with a single lead sheet, **1 inch** longer and wider than lath, laminated to the back of the lath so lead extends **1 inch** beyond one side and one end.

2.1.10 Lead-Lined Gypsum Board: Gypsum board of width and length required for support spacing and to prevent cracking during handling, with a single lead sheet laminated to the back of the board.

2.2 Doors and Frames:

2.2.1 Lead-Lined Steel Doors: Steel doors shall comply with NAAMM HMMA 861, except that a single continuous lead sheet, of thickness indicated and extending from top to bottom and edge to edge, shall be



installed either between back-to-back stiffeners or between stiffeners and stop face of door. Size doors for **1/16-inch** clearance from frames at heads and jambs and for minimum clearance at bottom.

2.2.2 **Lead-Lined Steel Door Frames:** Steel door frames shall comply with NAAMM HMMA 861 and lined with lead sheet of thickness not less than that required for doors and walls where frames are used.

2.2.3 **Lead-Lined Wood Doors:** Flush wood doors shall comply with NWWDA I.S. 1-A and have one continuous lead sheet extending from top to bottom and edge to edge, constructed in the core. Assemble lead lining and core with poured lead fasteners or steel bolts. Space fasteners not more than **1-1/2 inches** from door edge and about **8 inches** o.c. Countersink bolt heads and cover with poured lead.

2.2.4 **Neutron Shielding Doors and Frames:** Steel plate doors shall be lined with lead sheet and borated polyethylene and hung from structural-steel door frames.

2.3 **Lead Door Louvers:** Provide louvers with about 30 percent minimum free area, of sizes and types indicated. Fabricate from formed-lead sheet or lead extrusions of not less than lead thickness required for door in which louver is installed. Fabricate louvers to be lightproof with fixed maze-type blades that maintain required lead equivalence at all points and in all directions. Factory fit and assemble louvers in doors before shipping to Project site.

2.4 **View-Window Frames:** Fabricate from **0.0428-inch-thick**, formed-steel sheet or **0.064-inch** thick aluminum extrusions with mitered corners, welded or bolted with concealed fasteners.

2.4.1 Line with lead sheet formed to match frame contour, continuous in each jamb and across head and sill, lapping the stops, and fabricated wide enough to maintain an effective lap with lead of adjoining assemblies.

2.4.2 Construct so lead lining overlaps glazing material perimeter by at least **3/8 inch** and provide removable stops.

2.4.3 Form sill with an opening for sound transmission. Offset sound passage to make opening lightproof and to maintain required lead equivalence at all points and in all directions.

2.5 **Lead Glass:** Leaded glass shall be clear X-ray protective quality glass in single or multiple thicknesses. Leaded glass shall have lead equivalence required for the shield wall, door, or partition in which the leaded glass is installed.

2.6 **Modular Shielding Partitions:** Partial-height modular partitions assembled from factory-finished standard components consisting of lead-lined enameled steel framing members, lead-lined opaque panels, lead glazing plastic vision panels, and hardware necessary for assembly and for securing to other construction. Fabricate opaque panels from honeycomb-core metal panels with polyurethane paint finish.

2.7 **Film Transfer Cabinets:** Cabinets shall be factory-fabricated, double-wall construction, of **0.0428-inch-thick**, cold-rolled, stretcher-leveled, commercial-quality steel sheet free of scale, buckle, pits, and other defects.

2.8 **Informational Signs:** Fabricate signs by engraving lettering in high-pressure-laminate engraving stock with contrasting face and core. Machine engrave copy using high-speed cutters mechanically positioned by master templates for accurately formed letters, numbers, and symbols.

3.0 EXECUTION:

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3.1 Examination: Examine substrates in areas to receive radiation protection, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection. Do not proceed with installation until unsatisfactory conditions have been corrected. Delete below if lead sheet is not installed on concrete floors. Do not proceed until concrete surfaces are clean, dry, and free of depressions and sharp projections that could damage or penetrate lead sheet.

3.2 Installation: Shall be in accordance with manufacturer's instructions.

3.2.1 Workmanship: Sheet lead shall be installed free of waves, lumps, and wrinkles and with a minimum of joints. Joints in sheet lead shall provide protection equivalent to the protection provided by the adjacent sheet lead. Joints shall be finished smooth and neat.

3.2.2 Protection: Lead shields shall be used to maintain continuity of protection where unshielded built-in items penetrate lead linings. Where outlet boxes, junction boxes, ducts, conduits, and similar items prevent the use of shields, lead sleeves or lead lining shall be used. Fasteners shall not disrupt the continuity of shielding.



Section 13112 Pre-Engineered Structures

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pre-engineered metal buildings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Metal buildings shall be the design and product of a recognized metal building manufacturer who is regularly engaged in the fabrication of pre-engineered structures.

2.1 Design Requirements:

2.1.1 Metal Buildings shall be designed for the dead load, designated live loads, and combinations of these loads as set forth in the MBMA Low Rise Building Systems Manual.

2.1.2 Framing and Structural Members: Structural steel members shall be designed in accordance with AISC publication, Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Structural cold-formed steel framing members shall be designed in accordance with the AISI publication, Specification for the Design of Cold-Formed Steel Structural Members. Framed openings shall be designed to structurally replace the covering and framing displaced. Welding of steel shall be in accordance with AWS D1.1.

2.1.3 Exterior Covering: Maximum wind load deflection for wall sheets shall not exceed 1/180 of the span between supports; Maximum live load deflection for roof sheets shall not exceed 1/180 of the span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect.

2.2 Materials:

2.2.1 Hot-Rolled Structural Shapes: ASTM A 36 or A 529.

2.2.2 Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53.

2.2.3 Members Fabricated from Plate or Bar Stock: 42,000 psi minimum yield strength; ASTM A 529, A 570, or A 572.

2.2.4 Members Fabricated by Cold Forming: ASTM A 607, Grade 50.

2.2.5 Galvanized Steel Sheet: ASTM A 446 with G 90 coating.

2.3 Framing:

2.3.1 Rigid Frames shall be hot-rolled structural steel; factory-welded and shop-painted built-up "I" shape or open web rigid frame consisting of tapered or parallel flange beams and tapered columns. Furnish complete with attachment plates, bearing plates, and splice members. Frames shall be factory-drilled for bolted field assembly.

2.3.2 End Wall Columns shall be factory-welded, built-up "I" shape or cold-formed sections, fabricated of minimum 14-gauge material, and shop-painted.

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2.3.3 Wind Bracing shall be adjustable, threaded steel rods, 1/2 inch in diameter minimum; ASTM A 36 or A 572, Grade D.

2.3.4 Secondary Framing: Purlins, eave struts, end wall beams, and flange and sag bracing shall be minimum 16-gauge rolled formed sections and shop-painted. Base channel, sill angle, end wall structural members (except columns and beams), and purlin spacers shall be minimum 14-gauge cold-formed steel, galvanized.

2.3.5 Bolts shall be ASTM A 307 or A 325 as necessary for design loads and connection details. Bolts shall be shop-painted, except zinc- or cadmium-plated units shall be provided when in direct contact with panels.

2.4 Roofing and Siding: Provide flashings, closers, fillers, metal expansion joints, ridge covers, fascias, and other sheet metal accessories, factory-formed of same material and finish as roofing and siding.

2.4.1 Roof-Covering Assemblies shall have a wind uplift resistance rating of Class 90 in accordance with UL 580 and shall be listed in the UL Fire Resistance Directory for wind uplift resistance classification.

2.4.2 Steel Covering shall be zinc-coated steel conforming to ASTM A 446, Grade C, with G 90 coating complying with ASTM A 525. Steel sheets and panels shall be not less than 26-gauge.

2.4.3 Aluminized Steel Sheets shall be aluminum-coated, ASTM A 463, Drawing Quality with T1-40 coating. Metal thickness shall be not less than 26-gauge.

2.4.4 Aluminum Sheets shall be fabricated from aluminum alloy 3003 or 3004 Alclad with tempering as required to suit forming operations, ASTM B 209. Aluminum sheet thickness shall be not less than 0.032 inch.

2.4.5 Insulated Wall Panels shall be factory-assembled or field-assembled units, consisting of a central insulating core with metal interior and exterior face sheets securely fastened together with rivets, bolts, studs, "snap-on", or other approved methods of fastening, including interlocking with basic wall units.

2.5 Insulation:

2.5.1 Insulation shall be batts, blankets, and/or rigid material of required thickness and density to provide an overall tested heat transfer U-value as required. Insulation shall have a flame spread classification of 25 or less and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Exposed insulation shall be faced with a vapor barrier of vinyl film, vinyl reinforced foil, or foil reinforced kraft.

2.5.2 Rigid or Semirigid Board Insulation shall conform to Fed. Spec. HH-I- 558, Form A, Class 1 or Class 2. Insulation shall have a white non-dusting and non-shedding painted finish.

2.5.3 Blanket Insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Insulation shall have a white sheet vinyl facing.

2.6 Accessories:

2.6.1 General: Provide coated steel accessories with coated steel roofing and siding; aluminum accessories with aluminum roofing and siding.

2.6.2 Gutters shall be formed in sections, complete with end pieces, outlet tubes, and special pieces that may be required. Finish to match roof fascia and rake.



2.6.3 Downspouts shall be formed in sections, complete with elbows and offsets, and shall be finished to match wall panels.

2.6.4 Circular Gravity Roof Ventilators shall be low-profile, ridge type ventilators, complete with base, bird screen, hood, flashing, closures, and fittings, finished to match roof panels.

2.6.5 Continuous Ridge Ventilators shall be factory-engineered and fabricated units of continuous heat valve type.

2.6.6 Wall Louvers: Provide units fabricated of not less than 18-gauge steel, finished to match wall panels. Provide bird screens of 1/2-inch x 1/2-inch galvanized steel mesh in rewirable frames on exterior face of louvers. Secure screens with clips to ensure ease of removal for cleaning and rewiring.

2.7 Hollow Metal Doors and Door Frames shall comply with Recommended Specifications for Standard Steel Doors and Frames (SDI-100), Steel Door Institute.

2.7.1 Materials: Hot-rolled, pickled, and oiled in compliance with ASTM A 569 and A 568; cold-rolled in compliance with ASTM A 366 and A 568.

2.7.2 Hollow Metal Units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, shall comply with ANSI A115. Locate finish hardware in compliance with BHMA Recommended Locations for Builder's Hardware.

2.7.3 Hardware: Provide hardware for each door, as follows:

2.7.3.1 Hinges: 1-1/2 pair, steel, template hinges, 4-1/2 inches x 4-1/2 inches.

2.7.3.2 Lockset: Cylindrical, key in knob.

2.7.3.3 Threshold: Extruded aluminum (exterior doors only).

2.7.3.4 Weatherstripping: Sponge neoprene or extruded vinyl, enclosed in an aluminum housing. Bottom weatherstripping shall be an aluminum extrusion with vinyl sweep strip.

2.8 Overhead Doors:

2.8.1 Overhead Doors shall be industrial type of standard manufacture, fabricated of 24-gauge galvanized steel minimum or 0.032-inch thick aluminum. Accessories shall include galvanized steel track, torsion-spring mechanism, ball-bearing roller, cylinder lock, and weatherstripping. Doors shall be manually operated, except that doors over 144 square feet in area shall be chain hoist or electric motor operated.

2.8.2 Overhead Coiling Doors:

2.8.2.1 General: Provide operating door assemblies as a complete unit produced by one manufacturer, including door curtain, guides, counterbalance, hood, hardware, operators, and installation accessories.

2.8.2.2 Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading. Slats shall be structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication, or aluminum slats, 5052 alloy, standard mill finish, not less than 0.04 inch thick.

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2.9 Windows: Windows shall be of steel in accordance with the Steel Window Institute, The Specifier's Guide to Steel Windows, or of aluminum in accordance with the AAMA 101. Windows shall be complete with operating and locking hardware and glazing.

2.10 Fabrication: Shop fabricate to the required size and section, complete with base plates, bearing plates, and other plates as required for erection, welded in place, and with all required holes for anchoring or connections shop drilled or punched to template dimensions. Shop connections shall be power riveted, bolted, or welded. Field connections shall be bolted.

2.11 Shop Painting:

2.11.1 Clean Surfaces to be Primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.

2.11.2 Prime Structural Steel primary and secondary framing members with rust-inhibitive primer having over 50 percent rust-inhibitive pigment, such as red-lead mixed pigment alkyd varnish (Fed. Spec. TT-P-86, Type II) or zinc chromate iron-oxide alkyd (SSPC PAINT 25).

2.11.3 Prime Galvanized Members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer (SSPC PAINT 5).

3.0 EXECUTION: Erection shall be in accordance with the approved erection instructions. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, and other foreign materials.

3.1 Framing: Erect structural framing true to line, level, plumb, rigid, and secure. Provide rake or gable purlins with tight-fitting closure channels and fascias. Provide diagonal rod or angle bracing in both roof and sidewalls as required. At framed openings provide shapes of proper design and size to reinforce opening and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.2 Roofing and Siding: Arrange and nest sidelap joints so that prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage. Provide weather seal under ridge cap; flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

3.2.1 Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheeting and protruding equipment, vents, and accessories.

3.2.2 Wall Sheets: Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws.

3.3 Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories, for positive anchorage to building and weathertight mounting.

3.4 Swing Doors and Frames: Install doors and frames straight, plumb, and level.



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3.5 Overhead Doors: Set doors and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports. Adjust moving hardware for proper operation.

3.6 Windows: Anchor windows securely in place. Seal entire perimeter of each unit with elastomeric sealant used for panels. Adjust and lubricate operating sash (vents) and hardware for proper operation. Clean surfaces of window units. Mount screens directly to frames with tapped screw clips.

3.7 Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Install setting blocks at quarter points, set in a bed of sealant if heel-bead is used. Install spacers inside and out, all around, wherever liquid or plastic mastic compounds are used.

3.8 Thermal Insulation: Install blankets straight and true in one-piece lengths and both sets of tabs sealed to provide a complete vapor barrier.

3.9 Field Painting: Apply finish coating to factory-primed items.

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SECTION 13152 SWIMMING POOL ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of swimming pool equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Diving Stands shall be fabricated of 1-1/2 inch Schedule 40 stainless steel pipe complying with ASTM A 53 or electric-resistance-welded pipe complying with ASTM A 135, with a minimum yield strength of **30,000 lbf/sq. in.**; hot-dip galvanized internally and externally. Their use shall be directed by facility dimensional requirements and shall comply with APHA, USS, NCAA, AAU, and FINA.

2.2 Diving Boards shall be fabricated of all aluminum complying with ASTM B 179 and finish indicated and to comply with performance requirements for structural aluminum; mill finish or decorative baked-enamel powder-coat finish; or of laminated wood and fiberglass. All upper surfaces shall be non-skid, and all edges shall be rounded and sealed.

2.3 Ladders shall be fabricated from low carbon Type 304 stainless steel complying with ASTM A 240/A 240M or ASTM A 666; cold rolled and finished on exposed faces with No. 2B finish; and have raised non-skid treads. Quantities, locations, and clearances shall comply with National Spa and Pool Institute standards.

2.4 Lifeguard Chairs shall be fabricated from Type 304 stainless steel (framework and handrails) complying with ASTM A 240/A 240M or ASTM A 666; cold rolled and finished on exposed faces with No. 2B finish; and have raised non-skid treads and non-skid platforms. Units shall comply with Safety Requirements, published by the National Swimming Pool Institute, and OSHA standards.

2.5 Underwater Lights of not less than 0.5 watts per square foot of pool area shall be provided in accordance with Lighting and Wiring, published by the National Spa and Pool Institute, and Article No. 68D of the National Electrical Code.

2.6 Pool Covers shall be polyethylene, having a flame spread rating of "0" as per ASTM E 84. Materials shall be non-toxic, non-absorbent, non-permeable, chemical-resistant and have a upper service limit of 110 F. Storage reels shall be constructed of Type 304 stainless steel complying with ASTM A 240/A 240M or ASTM A 666; cold rolled and finished on exposed faces with No. 2B finish.

2.7 Slides shall consist of fiberglass bodies with integral continuous flowing water supply, Type 304 stainless steel frames complying with ASTM A 240/A 240M or ASTM A 666; cold rolled and finished on exposed faces with No. 2B finish; and raised non-skid ladder treads.

2.8 Hardware and Fasteners. Hardware shall be manufacturer's standard, commercial-quality, corrosion-resistant, hot-dip galvanized steel and iron, stainless steel, or aluminum; secure, vandal-resistant design. Fasteners shall be manufacturer's standard, corrosion-resistant, hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped; and theft resistant.

3.0 EXECUTION: (Section not used.)



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SECTION 13182 SLUDGE INCINERATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant incinerators. Products shall match existing materials and/or as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Refractory Materials shall comply with ASTM C 27.

2.2 Sand for Fluidized Bed shall be high silica sand having an effective size of 0.20 mm. and a uniformity coefficient of 1.8.

2.3 Repair and Replacement Parts for Burners shall be compatible with the existing burners.

3.0 EXECUTION:

3.1 Cleaning, Lubrication, and Adjustments: Thoroughly clean fan, blower, motor, and damper of dirt, dust, and other foreign material. Parts shall be lubricated and adjusted for proper operation.

3.2 Burner Parts shall be cleaned and primary and secondary air openings shall be adjusted as required for good combustion and to meet the design requirements for excess air to the burner. Adjustments shall be made with the incinerator in normal operation.

3.3 Cleaning of Fuel and Atomizing Lines: Gas, oil, air, and steam lines connected to the burner shall be disconnected, cleaned, and reconnected.

3.4 Startup: After completion of maintenance and repairs, the incinerator shall be started up and operating adjustments shall be made by the Contractor as required to achieve the design flow rate and emission quality of the incinerator.



SECTION 13204 CONCRETE/STEEL, ABOVE GROUND STORAGE TANK

1.0 Description of Work: This specification covers the furnishing and installation of an above ground concrete, steel interior double wall storage tank.

2.0 Products:

2.1 Primary Tank: The primary tank shall be rectangular in shape and have continuous welds on all sides, inside as well as outside. The primary tank shall be a minimum of 0.125 inch thick carbon steel

2.2 Concrete Encasement: The concrete encasement shall be 6 inches thick with a minimum design strength of 3000 p.s.i. The concrete mix shall have air entrained, and water reducing admixtures, fibermesh reinforcement, and steel reinforcement. Concrete portion of the tank shall be continuous and visually verifiable monolithic pour.

2.3 Fire Resistance: The tank shall be designed and tested to provide 2 hour fire protection for the interior tank.

2.4 Thermal and Corrosion Protection: The tank shall include thermal insulation to protect against temperature extremes.

2.5 Secondary Containment with Leak Protection: The tank system shall include an impervious barrier of 30 mil high density polyethylene to contain leaks from the primary tank. All exposed steel shall be powder coated to resist corrosion.

2.6 Overfill/Spill Containment: The tank shall include a minimum 5-15 gallon powder coated external or internal containment surrounding the fill pipe. The overflow container shall include a normally closed valve to release spilled product to the main tank.

2.7 Overfill Protection: Overfill protection shall be provided by two methods.

2.8 Exterior Finish: The exterior shall have a coated concrete finish to resist weather, reflect sunlight and inhibit corrosion.

2.9 Venting: Tank system shall conform to fire codes and UL standards.

2.10 Support Legs: Tank shall have concrete support legs of monolithic construction.

3.0 EXECUTION

3.1 The tank system and all accessories shall be installed in strict accordance with the manufacturers recommendations, and all applicable fire and environmental codes.

3.2 Tanks shall be installed on reinforced concrete base slab.

3.3 Tanks shall be marked FLAMMABLE, NO SMOKING and product identification.

3.4 Tank and concrete shall be shop fabricated and require no assembly at the site. Tank shall be supplied from a manufacture that has a minimum of 5 years of producing similar tanks.

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SECTION 13205 SETTLING CHAMBER

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant settling chambers and weirs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Interruptions of Treatment: Not more than one settling chamber shall be taken out of service at a time.

3.2 Installation:

3.2.1 Painting: Exposed new surfaces and surfaces marred during the work shall be painted to match existing color.

3.2.2 Startup: Final adjustments and startup shall be made in such a way as to ensure that all equipment operates at design conditions and rated capacity.

3.2.3 Weir Adjustment: Adjust existing weirs that have a top edge elevation variation of more than 1/32 inch, and all new weirs, to be level throughout their length at the elevation specified.

3.2.4 Weir Repair: Grind metal weir plates smooth and even, if grinding does not exceed amount of available equipment.



Section 13221 Water Treatment Plant Filters

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of gravity and pressure filters for water treatment plants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Repair Materials shall be epoxy type grout in compliance with ASTM C 881.

2.2 Steel Plate, Welding Rods, and Welding Electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.

2.3 Sequencing Controls and Solenoid Valves shall comply with NEMA ICS and UL 508.

2.4 Filter Media shall comply with the requirements of AWWA B100 and shall be equivalent to the existing filter materials.

2.5 Replacement Weirs and Troughs may be steel, conforming to ASTM A 36, or glass fiber reinforced plastic, in compliance with ASTM D 3841.

3.0 EXECUTION:

3.1 Tank and Trough Repair: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.

3.2 Weirs: Adjust weirs to the elevation required. Weirs may not have a top edge elevation variation of more than 1/32 inch throughout their length. Eroded top edges of metal weir plates shall be ground smooth and even, if grinding does not exceed amount of available adjustment.

3.3 Filter Media: Filtering materials shall be replaced in accordance with AWWA B100.

3.4 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the tank air space. Test sequence controls, solenoid valves, and backwash equipment to ensure that they operate at design conditions.

3.5 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing. Clean sequence controls and associated electrical contacts.

3.6 Painting: Exposed metal surfaces shall be painted.

3.7 Disinfection: Disinfect piping and filters in accordance with AWWA B100.

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SECTION 13222 PRESSURE FILTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of pressure filters for water treatment plants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Steel Plate, Welding Rods, and Welding Electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.

2.2 Relief Valves shall be set to relieve at 15 psi above the normal operating pressure of the tank.

3.0 EXECUTION:

3.1 General: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.

3.2 Repair of Pin Holes: Weld holes of diameter less than half the plate thickness in compliance with AWS D1.1.

3.3 Repair of Cracks: Patch cracks or holes larger than one half the thickness of the tank shell plate.

3.4 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the air space of the tank.

3.5 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing.



Section 13227 Backwash Tanks

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance for water treatment plant backwash tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Bolts and Screws: Existing bolts and screws removed due to repair work shall be replaced with new bolts or screws complying with ASTM A 193, Grade B8 and nuts complying with ASTM A 194, Class 8F of the same type, size, and finish.

2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be of like finish.

2.3 Steel Tank Repair Parts shall be as specified in ASTM A 36, A 131, A 283, or A 573, depending upon required thickness.

2.4 Steel Tank Coatings shall be as specified in AWWA D102.

2.5 Concrete Tank Repair Material shall be epoxy type grout in compliance with ASTM C881.

2.6 Concrete Tank Coatings shall be a taste-free and odor-free, coal-tar base coating.

3.0 EXECUTION:

3.1 Preparation: Temporary backwash tank and accessories shall be furnished and installed as required to provide uninterrupted service.

3.2 Installation:

3.2.1 Flame Cutting: No cutting by torch or flame shall be done without written authorization from the Contracting Officer.

3.2.2 Testing: Test tanks by filling with water and inspecting for leaks. Test piping and valves hydrostatically at one and one half times normal working pressure or 50 psig, whichever is greater.

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SECTION 13320 SEWAGE TREATMENT PLANT ELECTRICAL CONTROLS AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sewage treatment plant instrumentation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Applicable Data: Flow diagrams, loop diagrams, and installation drawings of the existing instruments and sampling systems for which maintenance and repair is to be provided should be requested from the Contracting Officer.

2.2 Instrumentation: All instrumentation shall be in accordance with the manufacturer's instructions.

3.0 EXECUTION:

3.1 Scheduling and Coordination: Contractor shall determine that arrangements have been made to take the equipment out of service for the duration of the work.

3.2 General: Perform listed maintenance procedures and repairs on meter and sampling system in compliance with the manufacturer's recommendations.

3.3 Calibration: Calibrate meter over the meter's range and adjust to read correctly.



SECTION 13321 WATER TREATMENT PLANT ELECTRICAL CONTROLS AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water treatment plant electrical controls and instrumentation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Items not specified but required for the proper installation or repair of a specified item of work shall be provided. Items shall be of proper type, size, design, and characteristics for the use intended. Parts shall be factory-made.

2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be finished with like finish in compliance with the manufacturer's standard practice.

2.3 Electrical Controls and Instrumentation Components for replacement purposes shall be designed for same service as the existing.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that requirements for removal of the equipment from service, the bypassing of control valves, and installing of temporary replacements have been coordinated with the Contracting Officer. Bypassing of control valves or putting a control instrument in the Remote-Hand-Control mode will be done by the plant operators.

3.2 Power Supplies that may be a hazard during the performance of the work shall be locked out.

3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.

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SECTION 13322 FLOW MEASUREMENT DEVICE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of current type, turbine type, compound type, and fire service type meters for the measurement of flow. Products shall match existing materials and/or shall be as directed by contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Current Type Meters in sizes ranging between 5/8 inch and 6 inches shall conform to AWWA C 700.

2.2 Turbine Type Meter For Customer Services in sizes ranging between 1-1/2 inches and 12 inches shall conform to AWWA C 701.

2.3 Compound Type Meters in sizes ranging between 2 inches and 10 inches shall conform to AWWA C 702.

2.4 Fire Service Type Meters in sizes ranging between 3 inches and 10 inches shall conform to AWWA C 703.

2.5 Current Type Meters, Propeller-Driven in sizes ranging between 2 inches and 36 inches shall conform to AWWA C 704.

2.6 Multi-Jet Type Meters in sizes ranging between 5/8 inch and 2 inches shall conform to AWWA C 708.

3.0 EXECUTION: Calibration shall result in the flow measurement device reading correctly over its normal operating range.



SECTION 13800 FLOOR SAFES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of floor safes. Products shall match existing materials and/or as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Floor safes shall be constructed of heavy plate steel complying with ASTM A 36 / A 36M. Safes shall be a minimum of 1" thickness for door and ½" thickness for walls. Doors shall be designed to fit full body size with solid steel hinge mechanism using steel pins and internal mounting bolts.

2.2 Accessory Features: Floor safes shall have lift out lid, UL listed key changeable combination lock with relocking capability, and cover plate for total concealment under a carpet. Drop slot in head is optional.

3.0 EXECUTION:

3.1 Installation: Floor safes can either be installed in concrete slab floors or installed in a concrete enclosure in a wood floor.

3.1.1 Concrete Slab Installation: The contractor shall diamond saw cut through the concrete slab and remove the resulting piece forming a hole of the manufacturer recommended size for floor safe placement (minimum 3" below safe position). The finish concrete mixture and top of floor safe shall be set level with finish floor.

3.1.2 Wood Floor Installation: The contractor shall build a concrete form of recommended dimensions. Concrete shall be wire reinforce. Wood form shall be striped prior to completion of installation. Concrete shall be permanently attached to adjacent floor joists. The floor safe and finished concrete shall be flush with the top of the floor.

3.1.3 Concrete Mixture: The cement mixture shall be minimum of 3500 psi at 28 days and comply with requirements of Division 3.

3.2 Safe Protection: The contractor shall seal the safe door with masking tape in such a way as to prevent concrete from seeping between the door and body. The contractor shall also ensure that no water or dirt enters the door or safe cavity.



SECTION 13955 VEHICLE BARRIERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of portable, semi-permanent, permanent, power-assisted or manually deployed vehicle barriers. Type, size and capacity shall be as indicated or shall match existing.

2.0 PRODUCTS:

2.1 Retractable Barriers: In the raised position, the total retractable barrier heights shall be no less than 28 inches above the roadway surface and the width indicated. In the lowered position, the retractable barrier shall extend no more than 5/8 inch above the roadway surface. Retractable barriers in the lowered position shall be capable of supporting a 32,000-pound axle load or a 16,000-pound wheel load. Design for this load shall be in accordance with AASHTO-01.

2.1.1 Powered Retractable Barrier shall be capable of 240 complete up/down cycles per hour. Barrier motion shall be instantly reversible and shall be capable of raising the barrier from the lowered position to the raised position within 8 seconds during normal use, and within 2 seconds during an emergency. Barrier shall be capable of being closed from the raised position to the lowered position in not more than 3 seconds. Portable power-assisted retractable barriers shall be equipped with on and off ramps for smooth transition between surfaces.

2.1.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.

2.1.1.2 Electric Motors: Unless otherwise indicated, electric motors shall have totally enclosed enclosures.

2.1.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. Equip hydraulic systems with pressure relief valves to prevent overpressure.

2.1.1.4 Hydraulic Power Unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe. Flexible and rigid hydraulic line working pressure shall exceed the maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.

a. Flexible hydraulic lines shall be in accordance with SAE J517.

b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.

2.1.1.5 Hydraulic Power Unit Enclosure: A NEMA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.



2.1.2 Manual retractable barriers shall be capable of being raised and lowered by manual means such as levers or hydraulics requiring a maximum 60 pounds of force. The manual mechanism shall contain a locking pin which accepts a padlock for securing the barrier when it is in the "UP" position.

2.2 Retractable Bollards: Total bollard height in the raised position shall be no less than 30 inches above the roadway surface and shall have an outside diameter of no less than 8 inches. Bollard system shall consist of a minimum of three bollards spaced no more than 32 inches from centerline to centerline of bollards across a 10-foot roadway. Bollards in the lowered position shall be capable of supporting a 16,000-pound wheel load each. Design for this load shall be in accordance with AASHTO-01.

2.2.1 Powered retractable bollards shall be capable of 240 complete up/down cycles per hour. Bollards shall be capable of being raised or lowered within a 3 to 15-second range during normal use and within 2.5 seconds for emergency operations.

2.2.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.

2.2.1.2 Electric motors shall have totally enclosed enclosures unless otherwise indicated.

2.2.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for period of time of up to 1 week. If a hydraulic system is used, it shall be equipped with pressure relief valves to prevent overpressure.

2.2.1.4 Hydraulic power unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. For ambient temperatures below 20 degrees F, a hydraulic oil heater shall be provided so that the oil viscosity remains between 80 to 4000 SUS. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe. Flexible and rigid hydraulic line working pressure shall exceed the maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.

a. Flexible hydraulic lines shall be in accordance with SAE J517.

b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.

2.2.1.5 Hydraulic Power Unit Enclosure: A NEMA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.

2.2.2 Manual retractable bollards shall be capable of being raised and lowered utilizing a recessed handle on the top surface of the bollard, with a maximum force of 60 pounds or a manual hydraulic pump requiring a max 60 pounds of force. A recessed panel at the base of each bollard, adjacent to the bollard in the "DOWN" position, shall contain a spring actuated latching mechanism that automatically secures the bollard in either the full "UP" or full "DOWN" position. The panel shall have an access cover with provisions for a padlock to secure the access cover.

2.3 Crash Gate shall consist of steel buttresses anchored into the ground and an above grade assembly consisting of a heavy steel structural or a combination of heavy steel and structural aluminum capable of being opened and closed. The height of the gate shall be a minimum of 84 inches from the road surface to the top of the gate frame. The length shall close and protect a minimum 120 inch clear opening. The

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maximum clear opening between the gate frame and end posts, between the bottom of the gate and finished grade, and between any grill work shall be 3 inches.

2.3.1 **Powered Crash Gate:** The gate movement shall be controlled by an electromechanical gate operator or a hydraulic gate operator consisting of an operator unit with required control circuits and operator station. The control and operating voltage shall be 24 vac (nominal).

2.3.2 **Failure Mode of Operation:** The system shall be designed to prevent opening of the crash gate in the event of electrical or mechanical failure. A disconnect system for the gate drive shall be provided to allow manual operation of the barrier in the event of a power outage.

2.3.3 **Manual crash gate** shall be capable of being hinged from either side. Hinge points of both buttresses shall each contain a locking pin with padlock acceptance for securing the crash gate in the closed position. The crash gate shall withstand a 10,000-pound vehicle at impact speed of 50 miles per hour, with maximum gate deflection or vehicle penetration of 10 feet.

2.4 **Crash Beam** shall be an above-grade assembly that, in the "DOWN" position, shall present a formidable obstacle to approaching vehicles. The height of the barrier shall be a minimum of 30 inches as measured from the roadway surface to the centerline of the crash beam. The crash beam shall be capable of blocking a minimum road width of 120 inches. The crash beam end shall contain a locking pin with padlock acceptance for securing the crash beam when it is in the "DOWN" position. Crash beam shall withstand a 10,000-pound vehicle at impact speed of 15 miles per hour, with a maximum beam deflection of 20 feet.

2.4.1 **Powered crash beam** shall be operated by means of a hydraulic power system. The crash beam shall be capable of being raised or lowered within an 8- to 15-second time range.

2.4.1.1 **Failure Mode of Operation:** A disconnect system for the crash beam shall be provided to allow manual operation of the barrier in the event of an electrical or mechanical failure.

2.4.2 **Manual crash beam** shall be manually raised and lowered with the aid of a counterbalanced end requiring approximately 60 pounds of force.

2.5 **Electrical Work:** Motors, manual or automatic motor control equipment except where installed in motor control centers, and protective or signal devices required for the operation specified herein, and wiring required for operation shall be provided in accordance with DIVISION 16 ELECTRICAL Section.

2.6 **Control Panel** and control circuit shall be provided to interface between all barrier control stations and the power unit. The control station is defined as the main control panel and the remote control panel as shown. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. The control panel shall allow direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and gate limit switches. The enclosure shall be as indicated on the drawings. All device interconnect lines shall be run to terminal strips.

2.6.1 **Voltage:** The control circuit shall operate from a 120 volt 60 Hz supply.

2.6.2 **Main control panel** shall be supplied to control barrier function. This panel shall have a key-lockable main switch with main power "ON" and panel "ON" lights. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. An emergency fast operate circuit (EFO) shall be operated from a push button larger than the normal controls. The EFO shall also be furnished with an EFO-active light and reset button. The main control



panel shall have a key lockable switch to arm or disable the remote control panel. An indicator light shall show if the remote control panel is enabled.

2.6.3 Remote control panel shall have a panel "ON" light that is lit when enabled by a key lockable switch on the main control panel. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. The EFO shall be operated from a push button larger than the normal controls. The EFO shall be interconnected with an EFO-active light. When the remote control panel EFO is pushed, operation of the barrier will not be possible from this panel until reset at the main control panel.

2.7 Miscellaneous Equipment:

2.7.1 Safety Equipment: Red/yellow 8-inch traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. Traffic lights are not required for manual barriers. The yellow light shall indicate that the barrier is fully open. All other positions shall cause the light to show red. Brackets shall be supplied to allow the light to be mounted a minimum 4.5 feet above the roadway pavement on a 3.5-inch outside diameter metal post or mounted directly on the crash gate.

2.7.2 Heater: A waterproof barrier heater with a thermostat control and NEMA 4 junction box connection point shall be provided for de-icing and snow melting. The heater shall provide barrier operation to an ambient temperature of minus 40 degrees F. For retractable bollards, a 250-watt heater shall be provided for each bollard.

2.7.3 Signage shall read "Axle Weight Limit 9 Tons" and shall conform to FHWA-01 sign (R12.2).

2.7.4 Vertical Arm Gates (Traffic Arms) shall have an opening and closing time of less than or equal to 15 seconds. The gates shall be capable of 15 duty cycles per hour as a minimum. Gate shall operate the arm through 90 degrees. Gate operators shall be supplied with single phase 120 volt motors. Each gate shall be capable of being operated from a remote open-close push button station. Gates shall have a hand-crank mechanism which will allow manual operation during power failures. Each gate shall be supplied with a hand crank. Gate arms shall be constructed out of wood, steel, fiberglass, or aluminum, as specified by the manufacturer for the given lengths as shown on the drawings. Gate arms shall be covered with 16-inch wide reflectorized red and white sheeting. Each gate shall be furnished with a spare gate arm. Gate operator cabinets shall be constructed of galvanized steel and shall be painted manufacturers standard color as approved. Each gate operator shall be provided with an obstruction detector that will automatically reverse the gate motor when an obstruction is detected. The obstruction detector shall be any of the following three types: An electronic loop vehicle detector buried in the road, a photocell electric eye mounted on the gate operator, or a safety strip mounted on the lower edge of the arm. The detector system shall be automatically deactivated when the arm reaches the fully lowered position. Slab size and anchorage for gate operator shall be per manufacturer requirements.

2.8 Finish: Surfaces shall be painted in accordance with requirements of DIVISION 9 Section on painting except for materials supplied with manufacturers standard finish. The roadway plate shall have a nonskid surface. The barrier front shall have 6-inch wide reflective yellow stripes 4 inches apart. Bollards shall be painted reflective yellow with 3-inch wide black diagonal stripes. The barrier crash gate shall be painted white and the crash beam shall be painted reflective yellow with 3-inch wide black diagonal stripes.

2.9 Concrete shall conform to DIVISION 3 Concrete section.

2.10 Welding shall be in accordance with AWS D1.1.

2.11 Pavement: After placement of the vehicle barrier, the pavement sections shall be replaced to match the section and depth of the surrounding pavement. Pavement shall be warped to match the elevations of

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existing pavement. Positive surface drainage, away from the vehicle barrier, shall be provided by pavement slope.

3.0 EXECUTION

3.1 Installation shall be in accordance with manufacturers instructions.

3.2 Buried Hydraulic Lines shall be placed in polyvinyl chloride (PVC) sleeves. Positive drainage shall be provided from the hydraulic power unit to the barrier for drainage of condensation within the PVC sleeve.

3.3 All controls shall be terminated with compression ring-style terminals. Roundhead screws and lock washers shall be used to provide vibration-resistant connections. Connections between any printed circuit cards and the chassis shall be made with screw connections or other locking means to prevent shock or vibration separation of the card from its chassis.



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DIVISION 14 CONVEYING SYSTEMS



SECTION 14210 PASSENGER ELEVATORS – ELECTRIC

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of passenger elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Elevators shall be of size, type, and operation directed by the Contracting Officer.

2.1.1 Elevators shall comply with the requirements of ANSI A17.1 "Safety Code for Elevators and Escalators" and ICC A117.1. Elevators with section 4.10 in the Americans with Disabilities Act (ADA) Accessibility guidelines (ADAAG), Section 407 in ICC A117.1, and FED-STD 795 Uniform Federal Accessibility Standards.

2.1.2 Calculations shall be provided to demonstrate compliance with ASME A17.1, Rule XXIV, and to demonstrate that the proposed elevator system meets requirements for seismic loading of the local zone in accordance with International Conference of Building Officials(ICBO) ICBO-01; certified copies of test reports may be submitted on lieu of calculations.

2.1.3 Elevator cab shall be manufacturer's standard cab and shall be of equivalent or greater value to a galvanized metal shell with enamel finish.

2.1.3.1 Elevator doors shall be galvanized metal with enamel finish.

2.1.3.2 Walls of elevator shall have raised plastic laminate panels.

2.1.3.3 Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer.

2.1.3.4 Elevator shall be complete with battery powered emergency lighting, emergency exit, handrails, exhaust fan, emergency communications systems, protective car pads and hooks.

2.1.3.5 Floor Finish shall be resilient tile flooring not less than 3/16 inch or vinyl tile not less than 1/8 inch thick. Tile shall be laid flush with the platform threshold.

2.1.3.6 Car and hoist-way doors for passenger elevators shall be operated simultaneously by an electric-power door operator. The doors shall operate smoothly in both directions and shall be cushioned to stop at the open and closed positions. Operators shall be high-speed heavy-duty type, which will provide an average door-opening speed of 2-1/2 fps. Reversal of doors when closing shall be accomplished by the "DOOR OPEN" button, car door safety edge, or interruption of the photoelectric light beams. In case of a power failure, the doors shall be capable of being opened manually.

2.1.3.7 Hoist-way frames and doors together shall be designed and fabricated as part of a Class B 1-1/2 Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory.

2.2 Operating Equipment:



2.2.1 Hoisting Equipment : As directed by contracting officer, provide either variable-voltage, variable-frequency ac-type or variable-voltage dc-type hoisting machines. Provide geared or gear-less traction machines as directed. Provide solid-state power converters. Provide regenerative system with total harmonic distortion of regenerated power limited to 5 percent per IEEE 519. Provide means for absorbing regenerated power when elevator system is operating on standby power. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

2.2.1 Sound and Vibration isolating foundation shall effectively prevent the transmission of machine vibration and sound to building structure. Location and deflection characteristics of isolation units shall produce a uniform and non-excessive loading on units under all operating conditions.

2.3 Finishes:

2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.

2.3.2 Enamel: Shop-applied baked enamel of color as selected by the Contracting Officer.

2.3.3 Plastic Laminate: Fed. Spec. L-P-508, color, texture, and pattern as selected by the Contracting Officer.

2.3.4 Stainless Steel shall be ASTM A 176 Type 302/304, austenitic, corrosion-resistant with grain of belting in direction of longest dimension. Surfaces shall be smooth and without waves and shall be in compliance with ASTM A 666 and ASTM A 568/A 568M.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

2.5 Passenger Car Operation Provide manufacturer's standard microprocessor operation system for each elevator or group of elevators as required to provide type of operation system indicated.

2.5.1 Single Elevator, Two-Stops: Provide "Automatic Operation" as defined in ASME A17.1

2.5.2 Single Elevator: Provide "Selective/Collective Automatic operation" as defined in ASME 17.1.

2.5.3 Multiple-Car Group: Provide "group automatic operation" as defined in ASME A17.1.

2.5.4 Auxiliary Operations: Provide standby power operation, independent service, loaded-car bypass, nuisance call cancel, earthquake emergency operation, and automatic dispatching of loaded car.

2.6 Controller: Elevator controller shall utilize a microprocessor-based logic system in compliance with ASME A17.1.

2.6.1 System shall provide comprehensive means to access the computer for elevator diagnostic purpose without need for any external devices and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller.

2.6.2 Failure of any single magnetically-operated switch, contact or relay to release in the intended manner; or the failure of any static control device, speed measuring circuit, or speed pattern generating circuit to operate as intended; or the occurrence of a single accidental ground or short circuit shall not permit the car

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to start or run if any hoist-way door or gate interlock is unlocked or if any hoist-way door or car door or car-top contact is not in the made position.

2.6.3 While on car-top inspection or hoist-way access operation, failure of any single magnetically-operated switch, contactor or relay to release in the intended manner; or the failure of any static-control device to operate as intended, or the occurrence of a single accidental ground shall not permit the car to move even with the hoist-way door locks and car contacts in the closed or made position.

2.6.4 Dedicated permanent status indicators shall be provided on the controller to indicate when the safety string is open, when the door locks are open, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator has failed to successfully complete its intended movement. In addition, the means of displaying other special or error conditions that are detected by the microprocessor shall be provided.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with ASME A17.1, applicable codes, and manufacturer's recommendations. Installation shall provide a quiet, smoothly operating installation, free from side sway, oscillation, or vibration. Tamper resistant fasteners are to be use in public areas.

3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2 "Inspectors' Manual for Electric Elevators". All deficiencies shall be corrected and re-tested.

3.4 Testing: shall be in accordance with requirements of ASME A17.1 and ASME A17.2.2 and as specified below. The Contractor shall conduct a complete test of the system. After the system has passed all tests, the Contractor shall notify the Contracting Officer in writing, 14 days prior to the time of performing the acceptance test, that the system is complete and is ready for final acceptance testing. The Contractor after receiving written approval from the Contracting Officer will conduct a complete acceptance test of the system. Final testing will be witnessed by a certified elevator inspector. The inspector shall be certified in accordance with ASME QEI-1. The Contractor shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 day after the completion of all testing.

3.4.1 Testing Period Each elevator shall be tested with the specified rated-load in car continuously for a period of 35 percent of the duty time. During the test run the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor. A manual test of the final limits (UP and DOWN over-travel) shall also be performed.

3.4.2 Speed Load Testing The actual speed of elevator car in both directions of travel shall be determined with the rated-load and with no-load in the elevator car. Actual measured speed of car with the rated-load in the UP direction shall be within 5 percent of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined shall not exceed 10 percent of the total difference between the UP and DOWN speeds.

3.4.3 Car Leveling Testing Elevator car-leveling devices shall be tested for accuracy of landing at all floors with no-load, symmetrical load, and the rated-load in both directions of travel.



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3.4.4 Temperature Rise Testing Temperature rise of hydraulic pump motor, motor drive, exciter and booster shall be conducted during the full-load test run for minimum one hour. Under these conditions, temperature rise of equipment shall not exceed the requirements established in NEMA MG 1 Chapter 12. Test shall be started when all parts of equipment are within the temperature required by NEMA at time of starting tests.

3.4.5 Insulation-Resistance Testing Insulation-resistance testing shall be performed to ensure that the complete elevator wiring systems will be free from short circuits and grounds. Electrical conductors shall have an insulation-resistance of not less than 1 megohm between each conductor and ground, and not less than 1 megohm between each conductor and all other conductors. Prior to testing, provisions shall be made to prevent damage to electronic devices.



SECTION 14211 PASSENGER ELEVATORS - HYDRAULIC

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of passenger elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Elevators shall be of size, type, and operation directed by the Contracting Officer.

2.1.1 Elevators shall comply with the requirements of ANSI A17.1 "Safety Code for Elevators and Escalators" and ICC A117.1. Elevators with section 4.10 in the Americans with Disabilities Act (ADA) Accessibility guidelines (ADAAG), Section 407 in ICC A117.1, and FED-STD 795 Uniform Federal Accessibility Standards.

2.1.2 Calculations shall be provided to demonstrate compliance with ASME A17.1, Rule XXIV, and to demonstrate that the proposed elevator system meets requirements for seismic loading of the local zone in accordance with International Conference of Building Officials(ICBO) ICBO-01; certified copies of test reports may be submitted on lieu of calculations.

2.1.3 Elevator cab shall be manufacturer's standard cab and shall be of equivalent or greater value to a galvanized metal shell with enamel finish.

2.1.3.1 Elevator doors shall be galvanized metal with enamel finish.

2.1.3.2 Walls of elevator shall have raised plastic laminate panels.

2.1.3.3 Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer.

2.1.3.4 Elevator shall be complete with battery powered emergency lighting, emergency exit, handrails, exhaust fan, emergency communications systems, protective car pads and hooks.

2.1.3.5 Floor Finish shall be resilient tile flooring not less than 3/16 inch or vinyl tile not less than 1/8 inch thick. Tile shall be laid flush with the platform threshold.

2.1.3.6 Car and hoist-way doors for passenger elevators shall be operated simultaneously by an electric-power door operator. The doors shall operate smoothly in both directions and shall be cushioned to stop at the open and closed positions. Operators shall be high-speed heavy-duty type, which will provide an average door-opening speed of 2-1/2 fps. Reversal of doors when closing shall be accomplished by the "DOOR OPEN" button, car door safety edge, or interruption of the photoelectric light beams. In case of a power failure, the doors shall be capable of being opened manually.

2.1.3.7 Hoist-way frames and doors together shall be designed and fabricated as part of a Class B 1-1/2 Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory.



2.2 Operating Equipment: Provide motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.

2.2.1 Pump units: Provide positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide solid state starting, and variable-voltage variable-frequency motor control.

2.2.2 Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.

2.2.3 Piping: Provide size, type, and weight piping as recommended by manufacturer of elevator. Provide flexible connections to power unit. Provide dielectric couplings at plunger/cylinder units. Encase underground piping in watertight PVC pipe.

2.3 Finishes:

2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.

2.3.2 Enamel: Shop-applied baked enamel of color as selected by the Contracting Officer.

2.3.3 Plastic Laminate: Fed. Spec. L-P-508, color, texture, and pattern as selected by the Contracting Officer.

2.3.4 Stainless Steel shall be ASTM A 176 Type 302/304, austenitic, corrosion-resistant with grain of belting in direction of longest dimension. Surfaces shall be smooth and without waves and shall be in compliance with ASTM A 666 and ASTM A 568/A 568M.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

2.5 Passenger Car Operation Provide manufacturer's standard microprocessor operation system for each elevator or group of elevators as required to provide type of operation system indicated.

2.5.1 Single Elevator, Two-Stops: Provide "Automatic Operation" as defined in ASME A17.1.

2.5.2 Single Elevator: Provide "Selective/Collective Automatic operation" as defined in ASME 17.1.

2.5.3 Multiple-Car Group: Provide "group automatic operation" as defined in ASME A17.1.

2.5.4 Auxiliary Operations: Provide standby power operation, independent service, loaded-car bypass, nuisance call cancel, earthquake emergency operation, and automatic dispatching of loaded car.

2.6 Electric controller shall be of the microprocessor based logic type with battery backup provided with reduced voltage starting. Components required for proper elevator performance shall be neatly wired and mounted in a completely enclosed in a cabinet with a latched door. Control cabinet shall be designed for mounting on power unit, wall or floor stand. Electric control apparatus shall be completely isolated from oil reservoir. A feature shall be incorporated in electrical control circuit which will cause elevator car to descent automatically to the lowest terminal landing, if the system runs low on oil during ascending of the

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car. The car and hoist-way doors shall automatically open when car reaches landing to allow passengers to exit. Parked car shall have doors in closed position and all control buttons shall be inoperative.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with ASME A17.1, applicable codes, and manufacturer's recommendations. Installation shall provide a quiet, smoothly operating installation, free from side sway, oscillation, or vibration. Tamper resistant fasteners are to be used in public areas.

3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2 "Inspectors' Manual for Electric Elevators". All deficiencies shall be corrected and re-tested.

3.4 Testing: shall be in accordance with requirements of ASME A17.1 and ASME A17.2.2 and as specified below. The Contractor shall conduct a complete test of the system. After the system has passed all tests, the Contractor shall notify the Contracting Officer in writing, 14 days prior to the time of performing the acceptance test, that the system is complete and is ready for final acceptance testing. The Contractor after receiving written approval from the Contracting Officer will conduct a complete acceptance test of the system. Final testing will be witnessed by a certified elevator inspector. The inspector shall be certified in accordance with ASME QEI-1. The Contractor shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 days after the completion of all testing.

3.4.1 Testing Period Each elevator shall be tested with the specified rated-load in car continuously for a period of 35 percent of the duty time. During the test run the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor. A manual test of the final limits (UP and DOWN over-travel) shall also be performed.

3.4.2 Speed Load Testing The actual speed of elevator car in both directions of travel shall be determined with the rated-load and with no-load in the elevator car. Actual measured speed of car with the rated-load in the UP direction shall be within 5 percent of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined shall not exceed 10 percent of the total difference between the UP and DOWN speeds.

3.4.3 Car Leveling Testing Elevator car-leveling devices shall be tested for accuracy of landing at all floors with no-load, symmetrical load, and the rated-load in both directions of travel.

3.4.4 Temperature Rise Testing Temperature rise of hydraulic pump motor, motor drive, exciter and booster shall be conducted during the full-load test run for minimum one hour. Under these conditions, temperature rise of equipment shall not exceed the requirements established in NEMA MG 1 Chapter 12. Test shall be started when all parts of equipment are within the temperature required by NEMA at time of starting tests.

3.4.5 Insulation-Resistance Testing Insulation-resistance testing shall be performed to ensure that the complete elevator wiring systems will be free from short circuits and grounds. Electrical conductors shall have an insulation-resistance of not less than 1 megohm between each conductor and ground, and not less than 1 megohm between each conductor and all other conductors. Prior to testing, provisions shall be made to prevent damage to electronic devices.



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SECTION 14212 FREIGHT ELEVATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of freight elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. This section is to be used in conjunction with sections 14210 and 14245.

2.0 PRODUCTS:

2.1 Elevators shall comply with the requirements of ANSI A17.1. When provisions for the handicapped are required, elevators shall comply with the requirements of ANSI A117.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer.

2.2 Operating Equipment:

2.2.1 Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.

2.2.2 Car Frame and Platform: Provide special heavy-duty welded steel units designed to withstand impacts and wheel loadings indicated. Provide car with dimensions and openings sized as directed by Contracting Officer.

2.2.3 Freight Elevator Car: shall have plain steel panel sides to top of car, fabricated of not less than 12 gauge steel, or as designated by Contracting Officer. Panels shall be not more than 36 inches wide. Top of car shall be not less than 14 gauge steel panels with a removable panel for emergency exit. Provide car with a finish floor of raised-pattern steel floor plate welded or bolted to platform framing members. Car shall be equipped with bumper guards.

2.2.3 Load-Weighing Device: Provide eighty percent maximum load indicator. Prevent elevator movement when rated capacity exceeded.

2.2.4 Sills and Door Frames: Provide structural steel door frames and truckable sills for hoist-way entrances.

2.2.5 Entrance Doors: Upper panel of each freight elevator hoist-way door shall be equipped with a clear wire glass vision panel. Lower panel of each freight elevator door shall be provided with a 1/2 inch thick steel toe guard. Door interlock system shall prevent movement until doors are properly closed.

2.2.6 Elevator Controls and Signals: Operating and signal fixtures for freight elevators shall conform to the general requirements for passenger elevator operating and signal fixtures, with the exception that complying with FED-STD 795 and 36 CFR 1191 is not required.

2.3 Finishes:



2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.

2.3.2 Enamel: Shop-applied baked enamel.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smoothly operating installation, free from side sway, oscillation, or vibration.

3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and re-tested.

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SECTION 14401 PERSONNEL LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of personnel lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Personnel Lifts: Personnel lifts shall be electrically operated, electronically controlled platform type. Capacity shall be as directed. Lift shall have a capacity safety factor of 5. Lift speed shall not exceed manufacturer's recommended rate of speed. Lift shall have double steps with non-skid surfaces spaced on belt. Drive belts and/or chains shall have safeties that automatically lock the carriage to the guide rails in the event of slack or lift belt/chain failure. Lifts shall conform to ANSI A90.1 "Man-lift Standard". Man-lifts shall be complete with necessary debris deflector, screens and guards for moving parts and floor openings.

2.2 Controls:

2.2.1 Three electrically operated safety stop devices mounded above top landing on "up" travel side. Two mounted on guide rails and one attached to head circles.

2.2.2 Three electrically operated safety stop devices mounted below bottom landing on "down" travel side. Two safety stop devices mounted on guide rails and one attached to man-lift legs.

2.2.3 Provide control rope system with wire in center of rope.

2.2.4 Red warning lights furnished and mounted immediately below top landing on "up" travel side, and below ceiling at bottom landing on "down" travel side.

2.3 Motor: Motors shall be sized for capacity of lifts. Motor shall be direct drive, gear type with totally enclosed electric brake. Power requirements shall be as directed.

2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs. Magnetic starter and electrical controls to be mounted in a pre-wired NEMA 12 (dust-tight) control panel. Fused disconnect switch within sight of motor shall be provided.

2.5 Ladder: Provide emergency ladder rungs mounted on one side of frame at twelve inches on center.

2.6 Hoist Belt: Provide either fourteen or sixteen inch wide belt of PVC solid woven polyester tested and certified for man-lift service. Basic warning messages and the direction of travel are to be stenciled onto the belt.

3.0 EXECUTION:



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3.1 Preparation: Prior to installation of lifts, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, lifts and equipment, and accessories in accordance with applicable codes and standards. Installation shall provide quiet, smooth operation free from side sway, oscillation, or vibration.

3.3 Inspection: At completion of installation, lifts shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and re-tested.

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SECTION 14402 WHEEL CHAIR LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wheel chair lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wheel Chair Lifts shall be of size, type, and configuration designated and shall be designed for the applicable exterior exposed to weather vertical lift configuration. Wheel chair lifts shall comply with the requirements of ANSI A90.1. In addition, lifts shall comply with Part XX and XXI of ASME A17.2, "Safety Code for Elevators and Escalators".

2.2 Operating Equipment: Motors, key-operated controllers, casings, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational chair lift shall be provided. A means of manual lowering shall be provided in case of a power failure. Rated capacity for lift shall be 550 pounds and 12 fpm.

2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on chair lifts for an exterior application shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed as to provide a proper size loop for the chair lift. Traveling cables shall have a fire resistant outer braid.

2.4 Platform: Provide 0.123 inch thick galvanized steel with black rubber flooring. Provide rectangular steel-tube frames with flush galvanized steel-sheet panels.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of chair lifts, ensure that installation surfaces are true to lines and levels. Check measurements of space for equipment and means of access for installation and operation.

3.2 Installation: Install machinery, guides, controls, chair lifts, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from side sway, oscillation, or vibration.

3.3 Inspection: At completion of installation, chair lift shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and re-tested.



SECTION 14416 VEHICULAR LIFTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vehicular lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Vehicular Lifts: Lifts shall comply with ANSI B153.1 and ALI/ETL requirements. Lifts shall have automatic mechanical lift locks. Lift lock shall be automatically activated when lift is operated to full stroke to prevent accidental lowering. Provide feature to allow manual lowering in case of power loss.

2.2 Operating Equipment: Column Lift frames of capacity selected, motors, controllers, pumps, hydraulic fluid reservoir, push type cylinders, metered control valves, plunger, piping, buffers, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational vehicle lift shall be provided.

2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the lift shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wire ways, except that flexible conduit may be used for short runs.

3.0 EXECUTION:

3.1 Preparation: Prior to installation of vehicular lifts, ensure that floors are level and will accept loading expected. Check measurements of space for equipment and clearances for operation.

3.2 Installation: Install machinery, controls, and lift and its equipment and accessories in accordance with manufacturer's instructions and applicable codes and standards, to provide a quiet, smoothly operating installation, free from side sway, oscillation, or vibration.



SECTION 14611 MATERIAL HANDLING HOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material handling hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Electric Chain Hoists: Hoist motors shall be H4 duty classification. Class F insulation shall be used in hoist motor for 30 minute operation. Load chain shall be grade 80 alloy, case hardened and zinc plated sized for the intended load. Hoists shall employ AC motor brakes employing single or multiple all-steel disks. Controls shall be hand held, low voltage electrical, with emergency shut off and enclosed in NEMA 3R rated weatherproof enclosure. Hoist shall include fail safe limit switches in the hoist enclosure. Hoist shall meet requirements of ANSI B30.16 standard. Load hook shall be heavy duty drop forged with safety latch. . Hoist shall have swivel top and bottom hooks.

2.2 Manual Chain Hoists: Load capacity of hoist shall be as specified. Load chain shall be grade 80 alloy, case hardened and zinc plated sized for the intended load. Load hook shall be heavy duty drop forged with safety latch. Hoist mechanism shall be double pawl ratchet system with Weston type brake using a non asbestos friction disk. Hoist shall have swivel top and bottom hooks. Hoist shall require between 50 and 80 pounds effort to move load.

2.3 Electric Wire Rope Hoists: : Hoist motors shall be H4 duty classification. Class F insulation shall be used in hoist motor for 30 minute operation. Lift range shall be between 20 and 150 feet. Lifting cable shall be pre-formed wire rope, of hoisting service construction, made of extra improved steel (XIP) with an independent wire rope center. Load hook shall be heavy duty drop forged with safety latch. . Hoist shall have swivel top and bottom hooks. Controls shall be hand held, low voltage electrical, with emergency shut off and enclosed in NEMA 3R rated weatherproof enclosure. Hoist shall include fail safe limit switches in the hoist enclosure. Hoist shall meet requirements of ANSI B30.16 standard.

3.0 EXECUTION: The Contractor shall complete the assembly of any equipment furnished partially assembled and place the items in position as directed. The hoists shall be assembled and securely bolted in position, hoisting chain or wire rope installed, and the hoist made ready for regular operation. The Contractor shall furnish all miscellaneous hardware items required to complete the installation of all equipment and components. Equipment shall be primed and finish painted with a suitable corrosion-resistant paint on all parts and components not made of corrosion-resistant materials or otherwise protected.



SECTION 14650 ASH HOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ash hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Winches and Sheaves:

2.1.1 Wire Rope Sheaves shall be iron or steel with bronze bushings, furnished either plain or as an assembly of frame, sheave, swivel hook, and axle as required.

2.1.2 Winches shall be of steel construction with bronze bearings on rotating parts. Winches shall have a capacity of not less than 500 pounds, with band action handbrake and drum width adequate for the quantity and diameter of wire rope to be used. Winches shall be marine type with gear cover and shall have corrosion-resistant parts and finish suitable for outdoor use.

2.1.2.1 Power Winches: NEMA 3 weather-protected, with two speeds (30 or 60 fpm) for lifting and a single speed for lowering, automatic upper-limit switch for hook travel, with push-button control.

2.1.2.2 Hand wench shall have spring-operated holding dogs, free-spooling feature, and adjustable handles.

2.1.3 Wire Rope: Wire rope shall be flexible, hoisting grade composed of approximately 7 strands or bundles of small diameter steel wire with a fiber or independent wire rope core.

2.2 Mast and Boom: Mast, boom, and miscellaneous fabricated components shall be provided as required to complete the unit assembly. Boom shall rotate. Fabricated parts shall be finished with a corrosion-resistant paint.

2.2.1 Mast shall telescope where required. Fully extended mast shall allow transport of ash container from bottom of pit to bed of truck without handling container twice.

2.2.2 Ash-Handling Pit shall have watertight door covering where required. Doors shall be mechanically linked to mast so that they automatically open and close with the raising and lowering of the mast.

3.0 EXECUTION: The Contractor shall complete the assembly of any equipment furnished partially assembled and place the items in position as directed. The ash hoist shall be assembled and securely bolted in position, hoisting ropes installed, and the hoist made ready for regular operation. The Contractor shall furnish all miscellaneous hardware items required to complete the installation of all equipment and components. Equipment shall be primed and finish painted with a suitable corrosion-resistant paint on all parts and components not made of corrosion-resistant materials or otherwise protected.

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SECTION 14660 CRANES AND HOISTS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cranes and hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Crane: Material Handling Industry Crane Manufacturers Association of America (MHI CMAA) 70 "electric overhead traveling cranes", MHI CMAA 74 "Top Running and Under Running, Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist", or ANSI MH27.1 for under hung cranes and monorail systems.

2.2 Hoist: Bridge drives shall be either the A-1 or A-4 drive arrangement as specified in MHI CMAA 70.

2.3 Hoisting Ropes: Hoisting ropes shall be regular lay, preformed, uncoated, improved or extra improved plow steel, 6 by 37 construction, with independent wire rope core conforming to FS RR-W-410, Type I, Class 3. The hoisting ropes shall be selected such that the rated capacity load plus the load block weight divided by the number of parts of rope shall not exceed 20 percent of the certified breaking strength of the rope. Hoisting ropes shall be secured to the hoist drum so that no less than three wraps of rope remain at each anchorage of the hoist drum at the extreme low position (limit switch stop).

2.4 Hook Assembly: shall be single barbed and shall be made of forged steel complying with ASTM A 668/A 668M. Hooks shall be fitted with safety latches.

2.5 Foot-walks: The location and construction of foot-walks shall be in accordance with ASME B30.2.

3.0 EXECUTION:

3.1 Installation : Major components of the crane shall be shop assembled as completely as possible. The erection procedures shall ensure that the crane is erected without initial stresses, forced or improvised fits, misalignments, nicks of high-strength structural steel components, stress-raising welds, and rough burrs. After the crane is erected, any damaged painted surfaces shall be cleaned and repainted. After erection is complete, the equipment shall be serviced. All necessary grease and oil, of approved quality and grade for the initial servicing and field test, shall be provided by the Contractor.

3.2 Testing: Unless otherwise indicated, the following tests shall be performed using a test load of 125 percent of rated load; a. Hoist Static Load Test, b. Dynamic Load Test, c. Hoist Load Brake, d. Hoist Loss of Power Test, e. Trolley Dynamic Load Test, and f. Dynamic Load Test.



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DIVISION 15 MECHANICAL



Section 15060 Mechanical Piping

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Piping shall comply with ANSI B31.1, where applicable. Piping in pressure systems shall comply with requirements of the ASME Boiler and Pressure Vessel Code, where applicable.

2.1 Steel Pipe:

2.1.1 Pipe: Carbon steel pipe shall comply with ASTM A 53 or A 106. Galvanized pipe shall comply with ASTM A 53. Stainless steel pipe shall comply with ASTM A 312.

2.1.2 Fittings: Malleable iron threaded fittings shall comply with ANSI B16.3. Forged steel threaded and socket weld fittings shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.11. Forged stainless steel threaded and socket weld fittings shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.11. Carbon steel butt welded fittings shall comply with ASTM A 234 and shall be fabricated in compliance with ANSI B16.9. Stainless steel butt welded fittings shall comply with ASTM A 403 and shall be fabricated in compliance with ANSI B16.9.

2.1.3 Flanges: Carbon steel flanges shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.5. Stainless steel flanges shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.5.

2.1.4 Bolting: Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2. Stainless steel bolting shall comply with ASTM A 193, Grade B8, with hex nuts complying with ASTM A 194, Grade 8F, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

2.2 Copper and Brass Pipe:

2.2.1 Pipe: Seamless copper pipe shall comply with ASTM B 42. Seamless red brass pipe shall comply with ASTM B 43. Copper pipe to be used with brazing or welding shall be oxygen free and shall comply with ASTM B 302 or B 88.

2.2.2 Fittings: Threaded fittings shall comply with ASTM B 249 and shall be fabricated in compliance with ANSI B16.15. Solder fittings shall comply with ASTM B 88 and shall be fabricated in compliance with ANSI B16.18. Butt welding fittings shall comply with ASTM B 302 or B 88 and shall be fabricated in compliance with ANSI B16.9.

2.2.3 Flanges shall comply with ASTM B 61 and shall be fabricated in compliance with ASME B16.24.

2.2.4 Bolting shall comply with ASTM B 36 and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

2.3 Cast and Ductile Iron Pipe:

2.3.1 Pipe: Bell and spigot pipe shall comply with ASTM A 74 and shall be in compliance with ANSI A112.5.1 and AWWA C106. Bell and spigot pipe is not as readily available as other pipe and shall only be



used to repair existing bell and spigot pipe. Push-on type pipe shall comply with ASTM A 377 and shall be in compliance with AWWA C151. Mechanical joint pipe shall comply with ASTM A 377, ANSI and AWWA C111 and C151. Flanged pipe shall comply with ASTM A 377, B16.1, and AWWA C115. Threaded pipe shall comply with ASTM A 377 and shall be threaded at both ends for screwed fittings.

2.3.2 Fittings: Bell and spigot fittings shall comply with ASTM A 74, ANSI A112.5.1, and AWWA C110. Bell and spigot pipe is not as readily available as other pipe and shall only be used to repair existing bell and spigot pipe. Push-on type fittings shall comply with ASTM A 126 or A 536 and AWWA C110. Mechanical joint fittings shall comply with ASTM A 126 or A 536 and AWWA C110 and C111. Flanged fittings shall comply with ASTM A 126 or A 536, ANSI B16.1, and AWWA C110. Threaded fittings shall comply with ASTM A 126 and ANSI B16.4.

2.3.3 Flanges shall comply with ASTM A 126 or A 536, AWWA C115, and ANSI B16.1.

2.3.4 Gaskets: Gaskets for cast-iron soil pipe shall comply with ASTM C 564. Gaskets for mechanical joint or push-on type pipe shall comply with AWWA C111.

2.3.5 Bolting: Alloy steel bolting shall comply with ASTM A 193, Grade B8, and A 194, Grade 8F. Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

2.4 Polyvinyl Chloride Pipe:

2.4.1 Pipe: Pressure rated pipe shall comply with ASTM D 1785. Waste, vent, and drain pipe shall comply with ASTM D 2665. Sewer pipe shall comply with ASTM D 2729.

2.4.2 Fittings: Threaded fittings shall comply with ASTM D 2464. Socket solvent weld type fittings for pressure pipe shall comply with ASTM D 2466 or D 2467. Socket solvent weld type fittings for waste and drain pipe shall comply with ASTM D 2665. Socket solvent weld type fittings for sewer pipe shall comply with ASTM D 2729.

2.4.3 Flange Dimensions shall be in compliance with ASME B16.5.

2.4.4 Bolting shall be alloy steel bolts and nuts complying with ASTM A 193, Grade B8, and A 194, Grade 8F.

2.5 ABS Pipe:

2.5.1 Pipe: Waste and drain pipe shall comply with ASTM D 2661. Sewer pipe shall comply with ASTM D 2751. All other ABS pipe shall comply with ASTM D 1527.

2.5.2 Fittings: Threaded fittings shall be Schedule 80 ABS and shall be industry standard. Socket solvent weld fittings for waste and drain pipe shall comply with ASTM D 2661. Socket solvent weld fittings for sewer pipe shall comply with ASTM D 2751. Socket solvent weld fittings for all other pipe shall be ABS Schedule 40 complying with ASTM D 2468 or ABS Schedule 80.

2.6 Vitrified Clay Pipe:

2.6.1 Pipe: Regular vitrified clay pipe shall comply with ASTM C 700. Perforated vitrified clay pipe shall comply with ASTM C 498.

2.6.2 Fittings shall be regular vitrified clay complying with ASTM C 700.

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2.6.3 Compression Joint Sealing Element shall comply with ASTM C 425 and shall be of rubber, plastic, or metal.

2.7 Asbestos Cement Pipe shall not be repaired but shall be replaced with new piping that does not contain asbestos, as directed by the Contracting Officer.

2.8 Polyethylene Pipe:

2.8.1 Pipe: Polyethylene shall comply with ASTM D 2447. Pipe shall be polyethylene SDRPR and shall comply with ASTM D 3035.

2.8.2 Fittings: Butt fusion type fittings shall comply with ASTM D 3261. Socket type heat fusion fittings shall comply with ASTM D 2683. Insert type heat fusion fittings shall comply with ASTM D 2609.

2.9 Conduit Systems:

2.9.1 Carrier Pipe: Carbon steel pipe shall comply with ASTM A 106. Polyvinyl chloride pipe shall comply with ASTM D 1785. Copper pipe shall comply with ASTM B 42. Fiberglass reinforced plastic pipe shall meet commercial standards.

2.9.2 Insulation: For systems 250 degrees or less, polyurethane foam insulation shall comply with commercial standards. For systems over 250 degrees, calcium silicate insulation shall comply with ASTM C 533.

2.9.3 Outer Jacket: For systems 250 degrees or less, polyvinyl chloride outer jacket shall comply with ASTM D 1785 or fiberglass reinforced plastic outer jacket shall meet commercial standards. For Systems over 250 degrees, cast-iron outer jacket shall comply with ASTM A 377, or steel conduit outer jacket shall be epoxy-coated, spiral weld, 10 gauge minimum.

2.10 Gaskets shall comply with ASME B16.21 and/or the following:

2.10.1 Gaskets shall be rubber complying with ASTM C 564.

2.10.2 Gaskets for mechanical joint or push-on type cast-iron or ductile iron pipe shall be rubber complying with AWWA C111.

2.11 Solvent Cement for solvent welding of pipe shall comply with ASTM D 2564, except solvent cement for ABS pipe and fittings shall comply with ASTM D 2235.

2.12 Dielectric Unions and Flanges:

2.12.1 Dielectric unions and flanges shall comply with Fed. Spec. WW-U-531 and requirements of ANSI B16.39 and ANSI B16.24.

3.0 EXECUTION:

3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.2 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.



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3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.

3.4 Solvent Cement Joints shall be made in compliance with ASTM D 2855.

3.5 Heat Fusion Joints in polyethylene pipe and fittings shall be made in compliance with ASTM D 2657.

3.6 Concrete Linings in cast and ductile iron pipe shall be prepared with cement mortar complying with AWWA C104. Pipe leak clamps shall be ductile iron, split sleeve type.

3.7 Protective Covering for Replacement Underground Steel Pipe shall be mechanically applied in a factory or field plant especially equipped for the purpose. Specials, valves, and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand. Joints shall be coated and wrapped by hand. The pipe covering shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar-saturated asbestos felt, and a wrapper of kraft paper or a coat of water-resistant whitewash, applied in the order named and complying with the requirements of AWWA C203 in all respects to materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Joints and fittings shall be coated and wrapped in compliance with AWWA C203.

3.8 Hydrostatically Test Pipe Systems where required by ANSI B31.1 or ASME Code.

3.9 Dielectric Unions or Flanges shall be provided for connections between ferrous and nonferrous metallic pipe or equipment.

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Section 15100 Valves

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of valves. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Valve pressure/temperature ratings shall equal or exceed the ratings of the valves being replaced. Pressure/temperature ratings shall be in accordance with ANSI B16.5. Valves shall comply with the ASME Boiler and Pressure Vessel Code where applicable.

2.1 Gate Valves shall comply with MSS SP-70 and MSS SP-80 as applicable.

2.2 Globe Valves shall comply with MSS-SP-85 and MSS SP-80 as applicable.

2.3 Check Valves shall comply with MSS SP-71 and MSS SP-80.

2.4 Needle Valves shall comply with MIL-V-24586 and/or with applicable MSS specifications.

2.5 Ball Valves shall comply with MSS SP-72.

2.6 Butterfly Valves shall comply with MSS SP-67 and/or AWWA C504.

2.7 Pressure Relief Valves shall comply with ANSI Z21.22 and ASME CSD-1.

2.8 Pressure Regulators shall comply with ASSE 1003 as applicable.

2.9 Flow Control Valves shall comply with MIL-V-23254.

2.10 Backflow Preventers shall comply with AWWA C506.

2.11 Vacuum Breakers shall comply with ASSE 1001 and MS-87005.

2.12 Solenoid Operated Valves: Coil shall be epoxy encapsulated, manufactured to UL 429, and rated for ac voltage.

2.13 Float Valves shall comply with Fed. Spec. A-A-246.

2.14 Stop and Waste Valves shall comply with MIL-V-22052.

2.15 Plugs and Cocks shall comply with MSS SP-78.

2.16 Diaphragm Valves shall comply with applicable MSS specifications.

3.0 EXECUTION:

3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.



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3.2 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.

3.3 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.



Section 15120 Piping Accessories

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Filters: Pressure-temperature rating and filter medium particle size retention rating of the replacement filter shall equal or exceed the ratings of the existing filter. Pressure drop at the required capacity shall not exceed that of the replaced filter. Filters shall be constructed in accordance with ASME Code where applicable.

2.2 Strainers shall comply with Fed. Spec. WW-S-2739.

2.2.1 Low Pressure Y-Type Strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 40 cast carbon steel.

2.2.2 High Pressure Y-Type Strainers shall comply with ASME Code if applicable. Strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 80 cast carbon steel.

2.3 Traps shall be in accordance with ASTM F 1139, and steam traps shall comply with ASME Code where applicable.

2.3.1 Thermostatic Traps shall be constructed of cast brass. Thermostatic element valve cone shall be stainless steel.

2.3.2 Float and Thermostatic Traps shall have body and cover constructed of cast iron or semi-steel. Thermostatic element shall have stainless steel valve cone and valve seat. Provide stainless steel or seamless copper float.

2.3.3 Inverted Bucket Traps shall have body and cover constructed of cast iron or semi-steel. Bucket shall be brass or stainless steel, with lever mechanism of heat-treated stainless steel.

2.3.4 Thermodynamic Traps shall have body and cover constructed of stainless steel. Disc shall be heat-treated stainless steel.

2.4 Expansion Joints shall comply with standards of the Expansion Joint Manufacturer's Association (EJMA). Replacement expansion joints shall equal or exceed the pressure-temperature ratings of the replaced expansion joint.

2.4.1 Expansion Compensators shall have 2 ply phosphor bronze bellows, brass shrouds, and end fittings for copper piping systems, or 2 ply stainless steel bellows, carbon steel shrouds, and end fittings for steel piping systems.

2.4.2 Rubber Expansion Joints shall be constructed of duck and butyl rubber with full-faced integral flanges, internally reinforced with steel retaining rings.



2.4.3 Slip Joints shall comply with ASME B31.1 and shall be of the type designed for repacking under pressure.

2.4.4 Flexible Ball Pipe Joints shall be designed for 360 degree rotation, with minimum of 30 degree angular flexing movement for sizes 1/4 inch to 6 inches, 15 degrees for sizes 8 inches and larger. Certify carbon steel joints for environmental shock testing in accordance with MIL-S-4456 or MIL-S-901C. Joints shall comply with Section II of ASME Boiler and Pressure Vessel Code and ANSI B31.1 Power Piping for materials and design of pressure-containing parts and bolting.

2.4.5 Expansion Joints for Grooved Piping shall be combination couplings and nipples constructed of cut grooved short pipe nipples and couplings, or slip-type expansion joints constructed of carbon steel pipe and couplings.

2.5 Pipe Supports: Pipe supports shall comply with MSS SP-58 and SP-69. Contact between dissimilar metals shall be prevented in supporting copper tubing. Those portions of pipe supports which contact the tubing shall be copper-plated, rubber- or vinyl-coated, or stainless steel. All pipe supports located in sewage wetwells shall be 18-8 stainless steel.

2.6 Valve Boxes shall be of cast iron, extension sleeve type; shall be not less than 5 inches in diameter; shall have a minimum thickness at any point of 3/16 inch; and shall be provided with cast-iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is used. All parts of valve boxes, bases, and covers shall be coated by dipping in bituminous varnish.

2.7 Flexible Hoses:

2.7.1 Flexible Hoses for Non-Ferrous Piping shall be bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.

2.7.2 Flexible Hose for Ferrous Piping shall be stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.

2.7.3 Rubber Flexible Hoses shall be rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings.

3.0 EXECUTION:

3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.

3.2 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and with ASME Code Section IX where applicable.

3.4 Y-Type Strainers shall be located in supply line ahead of the following equipment if integral strainer is not included in equipment.

- a. Pumps.
- b. Steam traps serving steam main drips.
- c. Temperature control valves.

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- d. Pressure reducing valves.
- e. Temperature or pressure regulating valves.

3.5 Installation of Steam Traps: Install strainer ahead of trap if not integral with trap.

3.6 Pipe Support Installation: Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to existing concrete and masonry.

3.7 Valve Boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box.

3.8 Flexible Hoses shall be installed on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.



SECTION 15160 PUMPS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumps. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Worn or Damaged Pump Parts shall be replaced rather than repaired.

2.2 New Pump Impellers, when required, shall be statically balanced before installation.

2.3 Used Impellers shall be checked for balance before reinstallation. Out of balance impellers shall either be balanced or replaced.

2.4 Close Coupled Pumps, when replaced, shall be replaced complete with motor.

3.0 EXECUTION:

3.1 Before Any Work is started, the pump driver shall be locked out and tagged to prevent any driving power to the pump. The pump suction and discharge piping shall be valved off, locked, and tagged, or pipe line blanks shall be installed.

3.2 Before Any Work is performed on pumps in acid or other toxic material service, the pump must be vented and drained (flushed, if possible). Acid-proof personal protection shall be worn until pump and parts have been cleaned and neutralized.

3.3 Gaskets shall be replaced whenever a gasketed joint has been disturbed.

3.4 Flexible Coupling Alignment shall be required if either the pump or motor mounting has been disturbed and shall be to the tolerances specified by the flexible coupling manufacturer.

3.5 Removal and Installation of impellers shall be accomplished using pullers, jacks, crane, or hoist. Impact tools are strictly prohibited.

3.6 Turbine Pumps removed from casings shall be lifted vertically to prevent damage to the pump or the pump casing.

3.7 New Impeller Rings, Gaskets, and Strainer shall be installed before reassembly of turbine pumps.

3.8 Relief Valve in discharge line for positive displacement pumps shall be set and tested at 110 percent of design discharge pressure or as recommended by pump manufacturer for service in which pump is used.



Section 15261 Insulation For Aboveground Pipe

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for aboveground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Insulation shall be in accordance with the following. Service Temperature, F Insulation Material
3,000 Maximum Fiber Blanket, ASTM C 892
1,600 Maximum Calcium silicate, ASTM C 533
1,500 Maximum Expanded perlite, ASTM C 610
1,200 Maximum Preformed mineral fiber, ASTM C 547
800 Maximum Cellular glass, ASTM C 552
225 Maximum Rigid, preformed cellular urethane, ASTM C 591
60 F and below Cellular glass, ASTM C 552 (cold piping) or mineral fiber, Fed. Spec. HH-I-558

2.2 Insulation Jacket Materials shall have fire hazard ratings that do not exceed 75 for flame spread and 150 for fuel contributed and smoke developed, except where otherwise required by the authority having jurisdiction. Test ratings shall be determined in compliance with ASTM E 84 and NFPA 255.

2.3 Accessory Materials, including insulating cements, adhesives, staples, coatings, tapes, bands, and other accessory materials shall be as recommended for the particular application by the manufacturer of the insulation or jacket.

3.0 EXECUTION: Vapor barrier shall be continuous throughout each piping run for cold piping (-30 F to 60 F).



SECTION 15262 INSULATION FOR UNDERGROUND PIPE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for underground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Insulation for Conduit Systems shall be calcium silicate complying with ASTM C 533 or polyurethane foam for low temperature systems (250 F and below).

2.2 Insulation Jackets for Conduit Systems shall be cast iron complying with ASTM A 377 or epoxy-coated spiral weld steel conduit for high temperature systems (above 250 F); or shall be polyvinyl chloride complying with ASTM D 1785 or fiberglass reinforced plastic for low temperature systems (250 F and below).

3.0 EXECUTION:

3.1 Backfill on Pipe System shall be 12 inches minimum.

3.2 Ground Surface shall be resodded or otherwise restored to the condition existing prior to the work.



SECTION 15281 BOILER FIREBOX INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler firebox insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Block or Board Insulation:

2.1.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 612.

2.1.2 Fiber blanket, ASTM C 892.

2.1.3 Calcium Silicate in accordance with ASTM C 533.

2.1.4 Cellular Glass in accordance with ASTM C 552.

2.1.5 Cellular Polyurethane in accordance with ASTM C 591.

2.1.6 Expanded Perlite in accordance with ASTM C 610.

2.2 Blanket Insulation: Mineral fiber rock, slag, or glass in accordance with ASTM C 553 or ASTM C 592.

2.3 Loose Fill Insulation:

2.3.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 764.

2.3.2 Vermiculite in accordance with ASTM C 516.

2.3.3 Perlite in accordance with ASTM C 549.

2.4 Insulating Cement:

2.4.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 195 or ASTM C 449.

2.4.2 Exfoliated Vermiculite in accordance with ASTM C 196.

2.5 Castable Refractory in accordance with ASTM C 401.

2.6 Spray-Applied Fibrous Insulation in accordance with ASTM C 720 and ASTM C 762.

2.7 Refractory Supports attached to pressure parts of the boiler shall comply with the ASME Boiler and Pressure Vessel Code.

3.0 EXECUTION:



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3.1 Safety: The boiler shall be removed from service, cooled, drained, and purged prior to conducting internal inspection or repairs. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic, explosive, or suffocating gases.

3.2 Closing up the Boiler: The repair shall not be covered by replaced or reinstalled materials until authorized.

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SECTION 15290 DUCTWORK INSULATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Rigid Fiberglass Ductwork Insulation shall conform to ASTM C 612. It shall consist of rigid fibrous glass board with foil facing, vapor sealed and attached to ducts with mechanical fasteners. Density shall be 3 lb/ft³.

2.2. Flexible Fiberglass Ductwork Insulation shall conform to ASTM C553, TYPE I, CLASS B-4. It shall consist of 3/4 lb/ft³ density fibrous glass blanket with reinforced foil and kraft facing lapped and joints sealed vapor tight.

2.3 Ductwork Insulation shall have a flame spread rating not exceeding 75 and a smoke developed rating not exceeding 150 as determined by test procedures in ASTM E 84. Components such as adhesives, mastics, and cements must meet the same individual ratings as the minimum requirements.

2.4 Adhesives shall conform to ASTM C 916.

2.5 Vapor Barrier shall conform to ASTM C 1136 Type I for exposed ducts and Type I or Type II for concealed ducts.

3.0 EXECUTION: Insulation shall be installed so that finishes are smooth and all joints are tight and sealed.



SECTION 15301 FIRE PROTECTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire protection systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fire Protection System Materials and Components shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in accordance with all applicable National Fire Protection Association (NFPA) National Fire Codes.

2.2 Test Reports shall be submitted for all tests required by referenced publications applicable to the particular materials and components furnished for use in the work.

3.0 EXECUTION:

3.1 The Design, Fabrication, Installation, and Testing of fire protection systems shall be in accordance with all applicable NFPA National Fire Codes and their respective appendices. These codes include but are not necessarily limited to the following:

NFPA 12	Carbon Dioxide Extinguishing Systems
NFPA 16A	Closed-Head Foam-Water Sprinkler Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 1961	Fire Hose
NFPA 1962	Fire Hose, Care, Maintenance and Use
NFPA 1963	Fire Hose Connections
NFPA 20	Fire Pumps, Centrifugal
NFPA 30	Flammable and Combustible Liquids Code
NFPA 11	Foam Extinguishing Systems
NFPA 11A	Foam Systems, Medium and High Expansion
NFPA 16	Foam-Water Sprinkler and Spray Systems
NFPA 12B	Halon 1211 Fire Extinguishing Systems
NFPA 12A	Halon 1301 Fire Extinguishing Systems
NFPA 24	Private Fire Service Mains

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NFPA 231C	Rack Storage of Materials
NFPA 13A	Sprinkler Systems, Care, Maintenance
NFPA 13	Sprinkler Systems, Installation
NFPA 14	Standpipe and Hose Systems
NFPA 26	Water Supplies, Valves Controlling
NFPA 22	Water Tanks for Private Fire Protection

3.2 Scheduling Interruptions and Coordination: At least 48 hours before commencing work on any specific system, the Contractor shall notify the Contracting Officer of all interruptions, if any, that must be made to the system and the estimated period of time the system will be out of service during each interruption. Interruptions shall be made only at the time or times approved by the Contracting Officer. Equipment and standby systems shall be provided for building protection during interruption to the existing systems.

3.3 Tests: All field tests required by applicable standards shall be performed in the presence of the Contracting Officer.



SECTION 15401 INTERIOR PLUMBING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of interior plumbing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of piping material.

2.0 PRODUCTS:

2.1 Drinking Water Dispensers:

2.1.1 Electric Water Coolers shall comply with ARI 1010 and shall use one of the halogenated hydrocarbons as refrigerant. Top surfaces of the dispenser in contact with water shall be stainless steel or porcelain enameled steel. Piping connections from the shutoff or stop valve and outlet valve arrangement shall be chrome-plated brass, copper tubing, or stainless steel.

2.1.2 Drinking Fountains shall comply with Fed. Spec. WW-P-541/6.

2.2 Hot Water Generators and Storage Tanks:

2.2.1 Heating Element for the hot water generator shall consist of U-bend coils, a tube sheet, and air element head. The coil shall be seamless tubing inserted into holes in the tube sheet and secured by expanding. The tube sheet shall be copper alloy or other nonferrous metal. Tubing for the heating element shall be light drawn copper tubing complying with ASTM B 75 or copper alloy tubing complying with ASTM B 111, copper alloy No. 706. Element shall be in accordance with 21 CFR 175.

2.2.1.1 Copper Tubing shall be designed for a working pressure of 150 psig steam and shall withstand an internal hydrostatic pressure of 225 psig for not less than 15 seconds without leaking or any evidence of damage.

2.2.1.2 Copper Alloy Tubing shall be designed for a working pressure of 400 psig with 400 F hot water and shall withstand an internal hydrostatic pressure of 600 psig for not less than 15 seconds without leaking or any evidence of damage.

2.2.1.3 The Head for the Heating Element shall be close grained cast iron or fabricated steel for steam service, or cast or fabricated steel for high temperature hot water service. The heads shall be partitioned to separate the steam supply and condensate return. The head shall be equipped with tappings or flanges for the supply, return, air relief, and vacuum breaker connections. The air-relief valve and vacuum breaker connection shall be ½ inch pipe size.

2.2.2 New Storage Tanks shall be constructed, tested, and marked in compliance with the ASME Boiler and Pressure Vessel Code, Section VIII. The tank shall be glass-lined steel. Tanks shall be cathodically protected if required by local conditions. Tanks shall be in accordance with Mil. Spec. MIL-T-12295. The thermal efficiency and standby heat loss shall comply with the requirements of ASHRAE 90A.

2.2.3 Storage Tank Repair shall comply with the ASME Boiler and Pressure Vessel Code, Section VIII.

2.2.4 Heaters/Storage Tanks shall be equipped with ASME rated accessories.

2.3 Pneumatic Water Supply Systems:

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2.3.1 New Pneumatic Tanks shall be designed for 125 psig working pressure and shall be constructed in compliance with ASME Boiler and Pressure Vessel Code, Section VIII. Tanks shall be equipped with manhole in head, water gauge glass, pressure gauges, water pressure relief valves, and tapped openings for all piping.

2.3.2 Compressor shall be belt-driven by a motor having a maximum speed of 1800 rpm. The motor shall have a manual across-the-line starter and thermal overload protection. Guards complying with OSHA requirements shall be provided for all exposed moving parts.

2.3.3 Control System: Pressure switches shall be of the adjustable type having an operating range of 30 to 90 psig. The switch shall be three position type.

2.4 Gas Fired Water Heaters:

2.4.1 Water Heater Storage Tank shall be steel with a copper or glass lining and shall comply with ANSI Z21.10.1. Equipment shall comply with the approval requirements of AGA Directory of Certified Appliances and Accessories. For elevations above 2,000 feet, the AGA rating shall be reduced at the rate of 4 percent for each 1,000 feet above sea level. Safety pilot valve shall be supplied to automatically shut off the main gas supply to the burner or burners in the event that the pilot flame is extinguished.

2.4.2 Flue Gas Piping shall be single-wall metal pipe constructed of not less than No. 24 B&S gauge sheet copper or No. 20 gauge galvanized sheet steel.

2.4.3 Relief Valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.4.4 Thermostat shall be snap action type actuated by water temperature.

2.5 Oil Fired Water Heaters:

2.5.1 Water Heater Tank shall be glass-lined steel. Tanks of 120-gallon capacity, or less, shall be hydrostatically tested to 300 psig. Tanks shall have vertical flue passages or annular flue passages between the tank and the casing. Tanks shall be cathodically protected if required by local conditions.

2.5.2 Burner shall be mechanical pressure atomizing type.

2.5.3 Controls shall consist of a combustion safeguard (primary control) to shut down the burner in event of ignition failure or flame failure, a limit control to prevent overheating in case of thermostat failure, and a thermostat of the adjustable immersion type to control water temperature.

2.5.4 Relief Valve shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.5.5 Draft Regulator shall be of the automatic, barometric type designed for installation in the chimney or flue connector at the outlet of the water heater. The draft regulator shall meet the requirements of UL 378.

2.5.6 Flue Gas Piping shall be single wall steel pipe, minimum 28 gauge. Finish shall be zinc coated or oxidized to form blue black color.

2.6 Electric Water Heaters:



2.6.1 Water Heater Tanks shall be glass-lined steel complying with UL 174, with dual heating elements. Each element shall be 4.5 KW. The elements shall be wired so that only one element can operate at a time. Tanks shall be cathodically protected if required by local conditions.

2.6.2 Relief Valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.

2.6.3 Thermostats shall be provided in compliance with UL 174.

2.6.4 Wiring shall comply with NFPA 70.

2.6.5 Heating Elements shall be medium watt density commercial grade incoloy sheathed flanged mounted elements with prewired terminal leads, and element fusing per the National Electrical Code.

2.7 Lavatories:

2.7.1 Lavatories shall be first quality vitreous china or enameled cast iron.

2.7.2 Drains and Jam Nuts shall be cast wrought copper alloy. Strainer shall be copper alloy or corrosion-resisting steel.

2.7.3 Faucets shall be single, center set, combination, or single control mixing type, complying with Fed. Spec. WW-P-541/4.

2.7.4 Stop Valves shall be angle or straight type and constructed of copper alloy, chrome plated.

2.7.5 Traps shall be P-type.

2.7.6 Soap Dispensers shall be glass or metal type with a capacity of 12 fluid ounces for liquid soap.

2.8 Urinals:

2.8.1 Wall-Hung Urinals shall have integral trap and extended shield; shall have washout, blowout, or siphon-jet flushing action; and shall be constructed of first quality vitreous china.

2.8.2 Pedestal Type Urinals shall have integral trap, siphon-jet flushing action, and a bottom outlet for connection to a closet type floor flange. Urinal shall be constructed of first quality vitreous china.

2.8.3 Trough Type Urinals shall be wall-hung with an integral flushing rim and shall be constructed of first quality vitreous china.

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SECTION 15451 STEEL TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Tank Materials shall be as required for the service by AWWA D100 or D103 for water tanks, or by API standards for petroleum product tanks.

2.2 New Tanks shall comply with AWWA or API standards as applicable for the service. Storage tanks for flammable liquids shall also comply with UL and NFPA requirements.

2.3 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.

2.4 Butt Weld Nozzles shall be in compliance with ANSI B16.25.

3.0 EXECUTION:

3.1 Tank Repair and Installation Work shall comply with applicable requirements of AWWA D100 or D103, or with API standards.

3.2 Welding shall be performed in accordance with AWS D1.1. Pipe welding to nozzles shall be performed in accordance with ASME Boiler and Pressure Vessel Code, Section IX.



SECTION 15452 PLASTIC TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Tank Material shall be reinforced fiberglass polyester in compliance with AWWA D120 for water tanks, or ASTM C 582 for tanks in chemical service.

2.2 New Tanks shall be horizontal, cylindrical tanks and shall comply with AWWA D120 or ASTM D 3299 as applicable. Chemical resistance tests, when required, shall be performed at the fabrication shop in compliance with ASTM C 581.

2.3 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.

3.0 EXECUTION: Repair and installation work shall be performed in compliance with recommended procedures and practices of SPII and of PPI, where applicable.

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SECTION 15475 POOL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pool equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Electric Swimming Pool Heaters shall be UL listed and shall conform to the ASME Boiler and Pressure Vessel Code. The heating elements shall be constructed of copper and shall be pre-wired with the connection at the element terminal sealed against moisture. Controls shall include a differential thermostat and a high temperature limit manual reset switch.

2.2 Gas-Fired Swimming Pool Heaters shall conform to the ASME Code and shall be approved by the American Gas Association. Heat exchangers shall be two-or four-pass design with copper-finned tubes. The burner shall be constructed of stainless steel and shall be provided with all necessary valving to meet ASME Code requirements.

2.3 Diatomite Filtration System shall consist of a centrifugal circulating pump, plastic filter elements surrounded by diatomaceous earth coating, a dry chemical feeder for feeding diatomaceous earth, and a modulating level control valve for the filter inlet line.

2.4 Swimming Pool Chlorinators shall be the gaseous chlorine cylinder-mounted type. Materials for construction of chlorinators shall be in accordance with recommendations of the Chlorine Institute.

2.5 Swimming Pool Surge Tank System shall include a surge tank, a vertical pump, and an electronic float switch. The surge tank shall be in compliance with ASME Code requirements for unfired pressure vessels.

2.6 Pool Drains shall be constructed of cast iron.

3.0 EXECUTION:

3.1 Personnel shall not begin repairs on the electric swimming pool heater until power to the heater has been disconnected.

3.2 Chlorine Gas Storage and Use shall be in accordance with recommendations of the Chlorine Institute Inc., Chlorine Manual.



SECTION 15481 COMPRESSED AIR EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of compressed air equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 All New Compressed Air Equipment and Materials for Repair or Replacement shall comply with ANSI/ASME B19.3, and ASME Boiler and Pressure Vessel Code, Section VIII.

2.2 New Reciprocating Air Compressors shall be of the single or two-stage, heavy-duty, double-acting, water-cooled or air-cooled, "Y" or "L" cylinder type complete with flange-mounted drive motor. The piston, valve, and cylinder construction shall not require lubrication. Teflon piston rings and Teflon or carbon rider rings shall be used. Compressors shall operate at a speed not in excess of 1,800 rpm.

2.2.1 Bearings: Main crankshaft bearings shall be anti-friction roller or ball type. Connecting rod bearings shall be sleeve type.

2.2.2 Valves: Compressor cylinder valves shall be of the channel, feather, or plate type suitable for service without external lubrication.

2.2.3 Lubrication: Force-feed lubrication system shall lubricate the crankshaft, connecting rod, and crosshead bearings.

2.2.4 Rod Packing: Piston rod packing shall be Teflon or carbon non-lubricating type.

2.2.5 Intake Air Filter - Silencer shall be a pipe-supported dry type capable of removing 95 percent of all particles 10 microns and larger.

2.2.6 Intercooler and Aftercooler shall be a shell-and-tube or plate type.

2.2.7 Motor shall be squirrel-cage induction, dripproof, NEMA Class B, with split-sleeve bearings.

2.3 New Centrifugal and Rotary Screw Compressors shall be of the multi-stage or two-stage type driven by an electric motor through speed-increaser gears.

2.3.1 Intake Air Filter-Silencer shall be a full-capacity dry type capable of removing 95 percent of all particles 10 microns and larger.

2.3.2 Blowoff Silencer shall be a full-capacity blowoff vent type.

2.3.3 Bearings: Centrifugal compressor radial bearings shall be of the pivoted shoe type. Axial bearings shall be Kingsbury-type thrust bearings capable of absorbing thrust in either direction. Rotary screw compressor radial bearings shall be anti-friction roller type. Ball thrust bearings shall be provided to carry the axial load.

2.3.4 Seals: Centrifugal compressors shall be labyrinth or carbon ring-type air and oil seals. Rotary screw compressors shall be stainless steel sealing rings.

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2.3.5 Intercoolers and Aftercoolers shall be water-cooled shell and tube type.

2.3.6 Vents and Drains: Vents shall be tapped and plugged. Drains shall be complete with drain valves.

2.3.7 Lubricating Oil System shall be a shaft-driven main oil pump, motor-driven auxiliary oil pump, dual oil coolers, oil reservoir, dual oil filters, pressure switches and gauges, check valves, valves, and interconnecting piping.

2.3.8 Check Valves shall be 150-pound class, carbon steel.

2.4 New Control Air Compressor and Dryer shall be air-cooled with a reciprocating compressor and a single receiver constructed in accordance with ASME Code requirements. Motor shall be NEMA Class B design with built-in overload protection. Unit shall include an air gauge, pop safety valve, external check valve, filter, pressure switch, and drain cock. Air dryer shall be refrigerated type designed for continuous operation with hermetically sealed compressor, heat exchanger, ambient air filter, and automatic drain trap. Oil and water filter shall have aluminum housing with pressure rating of 250 psig at 70 F and include manual drain valve and 10 replacement filters.

2.5 Aftercoolers shall be of the watercooled, shell-and-tube pipeline type with adequate surface area to limit the discharge to the temperature required. The unit shall include moisture separators, gauge glasses, automatic condensate traps, valves, drain piping, and thermal reliefs on the water side.

2.6 Receivers shall meet ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 requirements and shall include pressure gauge, relief valve, shutoff valve, automatic moisture trap, and drain valve. Receivers shall be designed for 200 psi.

2.7 All Rotating Parts and Equipment shall be true, dynamically balanced at the factory, and shall include vibration isolators.

2.8 Safety Guards shall meet OSHA requirements.

2.9 Pressure Regulators shall be designed for a maximum inlet pressure of 125 psi and a maximum temperature of 200 degrees F. Regulators shall be single-seated, pilot-operated with valve plug, bronze body and trim, and threaded connections. Regulator shall include a pressure gauge.

3.0 EXECUTION:

3.1 Repair and Replacement Work done on receiver tanks shall be in accordance with ASME Boiler and Pressure Vessel Code and the NBBI. Repair procedures shall provide structural integrity as required by NB-23.

3.2 Welding shall be performed in compliance with AWS D1.1 and ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Repaired Pressure Parts and Replacement Pressure Parts shall be tested after completion of repair or installation in accordance with the ASME Code.



SECTION 15556 FIRE TUBE BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire tube boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.0 EXECUTION:

3.1 No Personnel shall enter the boiler until the boiler has been removed from service, cooled, drained, and purged and the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.

3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NB-132 and have been approved by the Contracting Officer.

3.3 Waterside Repairs: Wash drum internals to remove loose scale and soft deposits prior to making repairs.

3.4 Fireside Repairs:

3.4.1 Remove Soot and Other Deposits from furnace tube, fire tubes, and tube sheets.

3.4.2 Cracks at the junction of the furnace tube and tube sheet shall be repaired by welding.

3.4.3 Boiler Shell and Tube Sheet Patches shall be designed and installed in compliance with the National Board Inspection Code Chapter VI. All patches shall comply with the requirements for new construction of ASME Boiler and Pressure Vessel Code, Section I or IV.

3.4.4 Damaged Fire Tubes shall be removed and replaced with new tubes, except for a single leaking fire tube, which may be repaired by plugging at tube sheet at both ends.

3.4.5 Corroded Surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code.

3.4.6 Seal Welds used for fluid tightness shall be applied in compliance with NB-132.

3.5 Closing the Boiler:

3.5.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

3.5.2 Front and Rear Door: Clean seating surface, replace gaskets, and close front and rear access doors.

3.5.3 The Repair shall not be covered by replaced or reinstalled materials until authorized.

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3.6 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.



SECTION 15557 WATER TUBE BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water tube boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.0 EXECUTION:

3.1 No Personnel shall enter the steam drum or lower drum until the boiler has been removed from service, cooled, drained, and purged and all steam and water valves, including drain and blowdown valves, have been closed, and locked or tagged. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.

3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of ASME Boiler and Pressure Vessel Code and the NB-132 and have been approved by the Contracting Officer.

3.5 Waterside (Internal) Repairs: Wash drum internals to remove loose scale and soft deposits. Turbine the water tubes. Perform chemical cleaning by either circulation or soaking.

3.6 Cracks in Drums shall be repaired in compliance with the NBBI National Board Inspection Code.

3.7 Tube Seat Leaks may be repaired by internal seal welding of the tubes in compliance with NB-132.

3.8 Fireside (External) Repairs:

3.8.1 Clean Deposits from fireside surfaces by washing with hot alkaline water, brushing, scraping, or air lancing. Surfaces shall be dried immediately after washing.

3.8.2 Corroded Surfaces may be built up by fusion welding in compliance with NB-132, Chapter VI.

3.8.3 Drum Shell Patches shall be designed and installed in compliance with NB-132.

3.8.4 Minor Cracks in tube shall be repaired by replacement of a tube section. Minimum length of replacement tube section shall be 12 inches. Use backing rings when sections are welded into existing tubes. Use the TIG (tungsten-inert-gas) process for the root pass.

3.8.5 For Major Tube Damage, replace entire tube. If only one or two tubes require replacement, the damaged tubes may be removed and the holes plugged if approved by the Contracting Officer.

3.8.6 Seal Welds used for fluid tightness shall be applied in compliance with NB-132.

3.9 Closing the Boiler:

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3.9.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

3.9.2 The Repair shall not be covered by replaced or reinstalled materials until authorized.

3.10 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.



SECTION 15558 HIGH TEMPERATURE WATER BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high temperature water boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

3.0 EXECUTION:

3.1 Personnel shall not enter the boiler until it has been removed from service, cooled, drained, and purged.

3.2 Repair and Maintenance Work shall be performed in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.

3.3 Tubes shall be replaced as specified in NB-23.

3.4 Tube Joints, Headers, and Drums shall be repaired as specified in NB-23.

3.5 Material and Equipment removed for access to the boiler or to make repairs shall be reinstalled following successful completion of performance tests and authorization of the Contracting Officer.

3.6 Repairs to Pressure Parts shall be inspected and tested as specified in NB-23. The Contractor shall submit the Inspection Certificate to the Contracting Officer.



SECTION 15559 CAST-IRON BOILERS AND FIREBOXES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of cast-iron boilers and fireboxes, and furnishing and installation of cast-iron boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Replacement parts and materials shall comply with the requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.1 Gas-Fired, Oil-Fired, and Combination Gas/Oil-Fired Boilers: Boilers shall be rated and tested in accordance with ANSI Z21.13. Boilers shall meet the requirements of the following safety codes and standards: UL 726, UL 795, and UL 296. Boilers shall be provided with combustion controls.

3.0 EXECUTION:

3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere has been checked and found to be free of toxic or explosive gases.

3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor, in compliance with requirements of the ASME Boiler and Pressure Vessel Code and NB-132, and approved by the Contracting Officer.

3.3 Clean Fireside Surfaces: Thoroughly clean flueway and firebox surfaces.

3.4 Clean Waterside Surfaces to remove sludge and sediment.

3.4.1 On Steam Boilers, open blowdown valve and flush water until clear while under steam pressure. On water boilers, open boiler drain cock to remove sludge and sediment that have settled to the bottom. Then refill boiler to correct water level for steam boilers or correct water pressure for water boilers.

3.4.2 If Boiler is Shut Down, remove plugs and open drain cock. Wash the inside of the boiler with water to remove sludge and sediment. Fill boiler and drain again. Fill boiler to correct level or pressure.

3.5 Replace Damaged Boiler Section: Clean seating surfaces and replace gaskets or sealant before installing boiler sections.

3.6 Repair Cracks by brazing in compliance with the ASME Boiler and Pressure Vessel Code, Section IV and Section IX.

3.7 Closing the Boiler:

3.7.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.

3.7.2 Other Materials: The repair shall not be covered by replaced or reinstalled materials until authorized.

3.8 Inspection and Testing of completed boiler repairs shall be in compliance with the ASME Code.



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SECTION 15560 CLEANING OF BOILERS

1.0 DESCRIPTION OF WORK: This specification covers cleaning of boilers. Products and materials used shall be in accordance with the boiler manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the boiler manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Equipment required for cleaning, such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizer tank and pump, power brushes, high pressure sprays, and other equipment shall be supplied by the Contractor.

2.2 Chemical Cleaning Materials:

2.2.1 Boilout Chemicals shall be trisodium phosphate complying with ASTM D 538, caustic soda complying with ASTM D 456, and soda ash complying with ASTM D 458.

2.2.2 Acid Cleaning Chemicals shall be:

Hydrochloric Acid complying with Fed. Spec. 0-H-765

Ammonium Bifluoride, $\text{N}_2\text{H}_4\text{F}_2$

Hydroxycetic Acid, CH_2OHCOOH , Technical Grade

Formic Acid, HCOOH , Technical Grade

Phosphoric Acid complying with Fed. Spec. 0-0-670

Sulfuric Acid complying with Fed. Spec. 0-S-809

Sulfamic Acid, HSO_3NH_2

2.2.3 Neutralizing-Passivating Chemicals shall be as follows:

Monosodium Phosphate, $\text{H}_2\text{NaO}_4\text{P}$

Di-sodium Phosphate, Na_2HPO_4

Ammonia, Anhydrous, complying with Fed. Spec. 0-A-445

Hydrazine, Anhydrous, H_2NNH_2

Sodium Sulfite complying with Mil. Spec. MIL-S-13943

Sodium Nitrate complying with Mil. Spec. MIL-S-322

2.2.4 Flushing Water shall be demineralized water with a conductivity end point of 50 micro-ohms.

2.2.5 Pressure Draining Gas shall be commercially pure, 99.5 percent nitrogen.

2.3 Mechanical Cleaning Materials and Equipment:

2.3.1 Brushes shall be of the type for use with power units.

2.3.2 Washwater shall be hot alkaline washwater for removing ash deposits.

3.0 EXECUTION:

3.1 Clean Boilers of all scale and deposits.



3.2 Inspection: After cleaning, the boiler shall be given a visual inspection for effectiveness of scale removal.

3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operations.

3.4 Alkaline Boilout:

3.4.1 Boilout Chemicals shall be completely dissolved in water before being introduced into the boiler.

3.4.2 Boilout chemicals shall be trisodium phosphate and caustic soda, 1,500 to 2,500 ppm concentration or caustic soda and soda ash, 3,000 ppm concentration.

3.4.3 Boilout Pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.

3.4.4 Concentration of Chemicals and duration of boilout will be dependent upon the scale analysis. Boilout time may vary from 8 to 24 hours with boiler water solids purged by blowdown at approximately 4-hour intervals.

3.4.5 Flush Unit with demineralized water until the effluent is clear of visible solids.

3.5 Acid Cleaning, using either the circulating or soaking method, shall be done in the following sequence.

- a. Wash heating surfaces with an acid solvent containing a proper inhibitor.
- b. Flush unit with clean water.
- c. Neutralize and passivate the unit.
- d. Flush the unit with clean water.

3.6 Circulating Method:

3.6.1 Acid Application: Acid cleaning time shall vary from a minimum of 4 hours, depending on scale analysis. Time shall be determined by analyzing samples of return solvent for iron concentration and acid strength.

3.6.2 Flushing: After cleaning, flush unit with demineralized water until pH reaches 6.5.

3.6.3 Neutralization: After flushing, neutralize the unit with ammonia and hydrazine for 2 hours at 200 F.

3.6.4 Final Flush: Final flush with demineralized water until pH reaches 7.5.

3.7 Soaking Method:

3.7.1 Application: Acid cleaning time shall vary from 4 to 8 hours depending on scale analysis. For soft sludges, cleaning time shall be a minimum of 4 hours. Cleaning time shall be 6 hours for thin coatings of hard scale. For heavy deposits, cleaning time shall be a maximum of 8 hours. The time periods noted are actual retention time of the solvent in the unit, including the time of filling and draining. Unit shall be drained under nitrogen pressure.

3.7.2 Flushing: After required cleaning time, flush unit with demineralized water.

3.7.3 Neutralizing: After flushing, the unit shall be neutralized and passivated with a solution of soda ash and boiled out for a period of 4 to 6 hours. The boilout pressure shall be operating pressure for boilers

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operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.

3.7.4 Final Flush: After boilout, the unit shall be drained and flushed with demineralized water containing sodium nitrate, until the pH reaches 7.5.

3.8 Effluent Neutralization: The solvent effluent drained from the unit shall be neutralized with caustic soda or soda ash to a pH of 6.8 to 8.5.



SECTION 15565 FIREBRICK FIREBOXES FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire brick fireboxes for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Replacement Parts and Materials for pressure parts, or for attachment to pressure parts, shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.2 The Following Refractory Materials shall comply with the requirements of ASTM C 27: fire brick, refractory tile, plastic refractory, castable refractory, and refractory mortar.

3.0 EXECUTION:

3.1 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and have been approved by the Contracting Officer.

3.2 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.3 Fire Tube Boilers:

3.3.1 When Replacing Burner Throat Tile, maintain correct throat diameter and ensure that throat is centered in the furnace.

3.3.2 Repair Burner Throat and Furnace Liner Tile Cracks with high temperature bonding mortar.

3.3.3 Wash Coat Burner Throat and Furnace Liner Tile with high temperature bonding mortar diluted with water.

3.3.4 Patch Cracks, 1/8 inch and larger in width, with high temperature bonding mortar or high temperature plastic refractory.

3.3.5 Patch Gap between castable refractory and baffle tile with high temperature plastic refractory.

3.3.6 Patch Damaged Rear Door Refractory with castable refractory.

3.4 Watertube Boilers: Repair cracks with ceramic fiber. Apply wash coat to burner throat.

3.5 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.

3.6 Drying Out:

3.6.1 Air Dry: Allow refractory to air dry as long as possible.

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3.6.2 Fire Dry: To thoroughly dry refractory by firing, fire boiler intermittently at low rate.



SECTION 15566 FIREBRICK FOR INSULATION OF BOILER FIREBOXES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of firebrick for insulation of boiler fireboxes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Replacement Parts and Materials for attachment to pressure parts of the boiler shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.

2.2 Firebrick, Plastic Refractory, Castable Refractory, and Refractory Mortar shall conform to the requirements of ASTM C 27.

3.0 EXECUTION:

3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.2 Repair and Maintenance Work shall be performed in accordance with procedures in compliance with requirements of the ASME Boiler and Pressure Vessel Code and NB-132, and approved by the Contracting Officer.

3.3 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.

3.4 Drying Out: Allow refractory to dry as long as possible.



SECTION 15571 OIL-FIRED AND GAS-FIRED BURNERS FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil-fired and gas-fired burners for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Oil-Fired Burner Pipe, Tubing, Fittings, Flanges, Valves, and Gaskets shall comply with the requirements of ASME B31.1.

2.2 Gas-Fired Burner Pipe, Tubing, Fittings, Flanges, Valves, and Gaskets shall comply with the requirements of ANSI Z223.1.

2.3 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of NFPA 85A, 85B, or 85D.

2.4 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1.

3.0 EXECUTION:

3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, purged and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.2 Before Welding, Brazing, or Cutting, gas piping shall be purged and the atmosphere checked and found to be free of an explosive gas mixture.

3.3 Oil-Fired Burner Repairs: All oil-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, NFPA 85A or 85D, and Mil. Spec MIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1.

3.4 Gas-Fired Burner Repairs: All gas-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI Z223.1 and C1, NFPA 85A or 85B, and Mil. Spec. MIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.2.

3.5 Inspection and Testing:

3.5.1 Leak Test all piping.

3.5.2 Pressure Test all piping in compliance with ANSI B31.1 for oil-fired burners or ANSI B31.2 for gas-fired burners.



SECTION 15572 COAL-FIRING SYSTEMS FOR BOILERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coal-firing systems for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Coal-Firing System Equipment and Materials shall comply with the requirements of ANSI B31.1, ASME Boiler and Pressure Vessel Code Section II, and NFPA 85E.

2.2 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of NFPA 85E.

2.3 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1 and NFPA 70.

3.0 EXECUTION:

3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.

3.2 Before Welding, Brazing, or Cutting, coal piping shall be purged and the atmosphere checked and found to be free of an explosive coal/air mixture.

3.3 Coal-Fired Burner Repairs: All coal-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, ASME Boiler and Pressure Vessel Code, Section II, and NFPA 85E. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section IX.

3.5 Testing: Leak test all piping. Pressure test all piping in compliance with ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section II.

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SECTION 15573 DRAFT CONTROL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of draft control equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Structural Steel shall comply with ASTM A 36.

2.2 Steel Pipe shall comply with ASTM A 53.

2.3 Piping Components shall comply with ASTM A 105.

2.4 Flanges, Fittings, and Valves shall comply with ASTM A 181.

2.5 Seamless Copper Tube shall comply with ASTM B 75.

2.6 Insulation shall comply with ASTM C 547.

2.7 Thermal Insulation and Finishing Cement shall comply with ASTM C 449.

2.8 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.

3.0 EXECUTION:

3.1 Safety: Adequate natural or forced ventilation shall be provided during repair activities conducted in confined spaces. Forced or induced draft fans shall be rendered inoperable before performing internal repairs to the fan casing or adjacent ductwork.

3.2 Repairs shall be accomplished in compliance with NFPA 70.

3.3 Welding and Brazing shall be performed in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

3.4 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.



SECTION 15576 BREECHING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of breeching. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Breeching:

2.1.1 Carbon Steel shall comply with ASTM A 568.

2.1.2 Galvanized Steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.1.3 Stainless Steel shall comply with ASTM A 167.

2.1.4 High Heat Insulating Refractory shall be an alumina-silica-base castable refractory complying with ASTM C 27.

2.1.5 Acid Resistant Liner shall be phenolic, rubber, and polyester resin liner.

2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.1.7 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.

2.1.8 Paint for prime coats and finish coats for touchup or refinishing shall be of the high heat-resistant type.

2.2 Masonry:

2.2.1 Mortar and Grout for repair of cracks in reinforced concrete shall comply with ASTM C 476. Mortar for use in the repair or replacement of brick lining in high heat breeching shall be ground fire clay complying with ASTM C 27. Chemical-resistant mortar shall be resin mortar complying with ASTM C 395.

2.2.2 Brick for lining of high heat breeching requiring acid resistance shall be refractory brick complying with ASTM C 27. Brick for breeching requiring acid resistance shall be chemical-resistant brick complying with ASTM C 279, type H.

2.2.3 Inspection Doors shall be heavy-duty cast iron or steel, lined on interior with insulating, castable refractory complying with ASTM C 64.

2.2.4 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.3 Refractory Brick:

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2.3.1 Brick shall be high heat refractory type complying with ASTM C 27.

2.3.2 Mortar: Fire clay mortar shall be of high heat, ground type complying with ASTM C 27.
Chemical-resistant mortar shall be the silica type complying with ASTM C 466.

2.3.3 Refractory shall be of the insulating, castable type complying with ASTM C 27.
Chemical-resistant type castable refractory shall be in compliance with ASTM C 401.

2.3.4 Inspection Doors shall be heavy-duty cast iron or cast steel, lined on the interior with insulating castable refractory complying with ASTM C 64.

3.0 EXECUTION:

3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.2 Welding: All welding shall be performed in compliance with AWS D1.1.

3.3 Installation of Breechings shall be in compliance with NFPA 211.



SECTION 15577 STACKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stacks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Stacks:

2.1.1 Carbon Steel shall comply with ASTM A 568.

2.1.2 Galvanized Steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.1.3 Stainless Steel shall comply with ASTM A 167.

2.1.4 Insulating Refractory shall be alumina-silica base castable refractory complying with ASTM C 27.

2.1.5 Acid-Resistant Liner shall be phenolic, rubber, and polyester resin liner.

2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.1.7 Insulation Jacket: Canvas jacket shall be 8-ounce standard proprietary canvas jacket. Aluminum jacket shall be 0.016 inch thick, corrugated, embossed, or smooth, complying with ASTM B 209, temper H14, Type 3003 or 5010 with 50-pound polyethylene vapor barrier. Supports for aluminum jacket shall be stainless steel Z-clips and bands 0.016 inch thick by 3/4 inch wide.

2.1.8 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.

2.1.9 Steel Rivets shall comply with ASTM A 502.

2.1.10 Steel Structural Wire Rope shall be zinc-coated and shall comply with ASTM A 603.

2.1.11 Paint For Prime Coats and Finish Coats for touchup or refinishing shall be of the high-heat-resistant type.

2.2 Masonry Stacks:

2.2.1 Ceramic Glazed Clay Brick shall comply with ASTM C 126.

2.2.2 Chemical-Resistant Masonry Units shall comply with ASTM C 279.

2.2.3 Castable Refractory shall comply with ASTM C 401.

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2.2.4 Mortar for Fireclay Brick shall comply with ASTM C 27. Mortar for chemical-resistant applications shall comply with ASTM C 395. Mortar and grout for reinforced masonry shall comply with ASTM C 476.

2.3 Prefabricated Stacks shall consist of double-wall vent pipe and fittings. All components shall be UL-listed and shall comply with NFPA 211.

3.0 EXECUTION:

3.1 Installation or Repair of all stacks shall be in accordance with NFPA 211.

3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.

3.3 Welding: All welding shall be performed in compliance with AWS D1.2.



SECTION 15580 BOILER FEEDWATER EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler feedwater equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Specialty Components and Parts shall be in accordance with applicable requirements of the ASME Boiler and Pressure Vessel Code.

2.2 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.

3.0 EXECUTION:

3.1 Repairs shall be accomplished with either the entire feedwater system or applicable portions isolated from service and drained.

3.2 All Isolation Valves shall be secured in the closed position, all drain valves secured in the open position, and pumps rendered inoperative before and during repairs to the deaerators, softeners, and chemical feeders.

3.3 Welding shall be performed in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

3.4 Electrical Work shall comply with the requirements of NFPA 70.

3.5 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.

3.6 Repair Procedures for receiver vessels shall provide structural integrity as specified in NB-23.

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SECTION 15581 GAS METERS AND REGULATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas meters and regulators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Meters: Meters shall conform to ANSI B109.2, Style B, without resettable counter. Meters shall be pipe or pedestal mounted.

2.2 Pressure Regulators: Pressure regulators shall have iron or steel bodies and shall be adjustable for changing the downstream pressure. The regulator shall be adjustable with automatic loading, and shall have automatic pressure relief. The pressure relief shall be diaphragm-operated, spring-loaded type with vent for relief.

2.3 Valves: Valves shall conform to API Spec. 6D, Class 150.

3.0 EXECUTION:

3.1 Installation of Meters shall conform to ANSI B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance.

3.2 Installation of Pressure Regulators shall be installed with by-pass line and lubricated plug valves installed in the by-pass line and on each side of the regulator between the regulator and by-pass connections.

3.3 Installation of Strainer shall be upstream of meter.

3.4 Installation of Pressure Reducing Valve at Meter Station shall be provided as needed.



SECTION 15590 FUEL HANDLING SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fuel handling systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fuel Handling System Components shall comply with applicable requirements of API.

2.2 Fuel Unloading Hose shall be in compliance with applicable requirements of UL 180, 330, 536, and 569 and of ANSI/ASME B31.3.

2.3 Gasoline Dispensing Pumps shall be in compliance with applicable requirements of UL 79 and 87 and of MIL-P-10406.

2.4 Oil/Water Separators shall be of the coalescing type, with coalescing media as required for the application. Separators shall be repaired or constructed in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.0 EXECUTION:

3.1 Repair and Replacement Work shall be performed in compliance with applicable requirements of NFPA 30, NFPA 70, and the ASME Code.

3.2 Welding shall be performed in accordance with ANSI B31.3 and ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Flushing: Repaired or replaced systems shall be flushed with the same type of fuel intended for use in the system until the outflowing fuel is free of sediment and emulsion and does not appear cloudy or hazy.



SECTION 15610 WARM AIR FURNACES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of warm air furnaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Furnace shall comply with the AGA Directory of Certified Appliances and Accessories, NFPA 70, and UL 296, 378, 499, 727, 795, and 900 as applicable.

2.2 Filters may be permanent, cleanable type or throw-away type and shall comply with requirements of UL 900. Face velocity of air at maximum flow rate shall not exceed 360 cubic feet per minute for standard velocity filters and 520 feet per minute for high velocity filters.

2.3 Flues shall be double-walled and constructed of galvanized steel complying with ASTM A 526.

2.4 Controls:

2.4.1 Thermostats shall be low voltage type designed to operate on control circuits not exceeding 30 volts.

2.4.2 Limit Control for Oil or Gas Furnaces shall be designed and installed to shut down the burner when the bonnet air temperature reaches 200 F. Differential shall be fixed at not less than 10 F and not greater than 25 F.

2.4.3 Blower Control shall prevent operation of blower after burner has fired until the discharge air at bonnet reaches a predetermined temperature. Fan "on" setting shall be adjustable within range of 90 F to 140 F. Differential setting may be fixed between 24 F and 36 F or adjustable between 20 F to 50 F. Blower control shall include manual switch.

2.5 Gas Furnaces:

2.5.1 Gas Burners shall be of corrosion-resistant steel and shall be designed, adjusted, rated, and certified to fire natural, manufactured, mixed, or propane gas. Burners rated 400,000 Btuh input or less shall be manually or electrically ignited, standing pilot type. Burners rated greater than 400,000 Btuh input shall be electrically ignited, proven pilot type.

2.5.2 Heat Exchangers shall be fabricated from steel complying with ASTM A 568.

2.5.3 Gas Valves shall be provided with a safety shutoff that will, in the event of flame failure, cause safety shutdown of the burner; an automatic pilot; and except for furnaces firing propane gas, an automatic gas pressure regulator.

2.5.4 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424, with baked enamel coating.

2.6 Oil Furnaces:

2.6.1 Burners shall be of flange-mounted high pressure atomizing type. Burner ignition shall be by continuous, automatic, cadmium cell control. The burner shall incorporate an oil pump, burner motor, combustion air fan, and burner tube.

2.6.2 Heat Exchangers shall be fabricated from cold-rolled steel complying with ASTM A 568 with radiation shield and combustion chamber of stainless steel complying with ASTM A 167.

2.6.3 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424 with baked enamel coating.

2.7 Electric Furnaces:

2.7.1 Heater Elements shall be helically coiled, nickel-chromium wire, individually sequenced with individual thermal limit controls and fusible links for each element. Entire design shall be UL 499 listed and shall comply with NFPA 70.

2.7.2 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424 with baked enamel coating.

3.0 EXECUTION:

3.1 New Furnace shall be installed in accordance with UL 499, UL 727, or UL 795 as applicable.



- 3.2 Welding shall be performed in compliance with AWS D1.1.
- 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.
- 3.4 Corroded Heat Exchangers shall be removed and replaced.
- 3.5 Flue: Replace corroded sections of flue in compliance with UL 378.
- 3.6 Controls: Replace defective controls in compliance with NFPA 70.



SECTION 15621 GAS UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Unit Heater shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; and UL Electrical Construction Materials Directory and UL 795.

2.2 Heat Exchangers shall be fabricated from steel complying with ASTM A 569 to form a unitized, multi-section type heat exchanger and combustion chamber for each burner.

2.3 Burners shall be of a corrosion-resistant steel with unitized rows of burners to provide one burner per heat exchanger section and shall have crossover igniter to provide positive ignition of each burner row.

2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity and shall include a flue connection. The housing shall be provided with means for suspension or floor mounting as required.

2.5 Fans shall be the propeller type, fabricated of aluminum or steel, dynamically balanced, and direct motor driven. Fan motors shall be totally enclosed type, and built-in thermal overload protection shall be provided for single-phase motors.

2.6 Controls:

2.6.1 Thermal Limit Control shall be provided to shut off gas supply in the event normal operating temperatures are exceeded.

2.6.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heat exchanger temperature is reduced to prevent excessive heat build-up.

2.6.3 Gas Valve with Safety Shutoff and Manual Main Shutoff shall be provided with automatic pilot and shall automatically regulate gas pressure and, in the event of flame failure, shall cause safety shutdown of burner.

2.6.4 Thermostat shall be wall-mounted, heavy-duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

3.0 EXECUTION:

3.1 Welding shall be in compliance with AWS D1.1.

3.2 Blazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with ASTM D 520.



SECTION 15622 OIL UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Unit Heaters shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; UL Electrical Construction Materials Directory; and UL 296.

2.2 Heat Exchangers shall be of corrosion-resistant steel and shall include a combustion chamber (primary heating surface) and a heat exchanger (secondary heating surface).

2.3 Burners shall be the high pressure or low pressure atomizing type. The burner shall be completely automatic and shall incorporate an oil pump, burner motor, combustion air fan, burner tube, and automatic ignition.

2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity. The housing shall be provided with means of suspension. Housing shall include a flue connection.

2.5 Fan shall be the propeller type fabricated of aluminum or steel.

2.6 Controls:

2.6.1 Thermal Limit Control shall be provided to shut off oil supply in the event normal operating temperatures are exceeded.

2.6.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heater exchanger temperature is reduced to prevent excessive heat build-up.

2.6.3 Thermostat shall be unit- or wall-mounted and shall be heavy duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

3.0 EXECUTION:

3.1 Welding and Brazing shall be in compliance with AWS D1.1.

3.2 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with ASTM D 520.

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SECTION 15661 AIR-COOLED CONDENSING UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled condensing units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: All products shall be rated in accordance with ARI 210 and 270.

2.1 Compressor: Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts, and capacity modulation.

2.2 Condenser Coils: Provide copper tubes with mechanically bonded aluminum fins.

2.3 Fans and Motor: Provide propeller-type with direct drive or belt drive and vertical discharge. Protect fan with heavy-gauge wire guard. Provide motors which are inherently protected, permanently lubricated, and weatherproof. Motors shall be totally enclosed type or dripproof.

2.4 Casing: Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy-gauge steel that is zinc coated and finished with enamel.

2.5 Controls: Provide safety and operating controls, factory-wired and mounted in an enclosure. Include pressure switches and motor overload devices.

3.0 EXECUTION: Follow manufacturer's recommendations.



SECTION 15670 CONDENSERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of condensers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Air-Cooled Condensers:

2.1.1 New Air-Cooled Condenser, when required, shall be a factory-fabricated and assembled unit consisting of coils, fans, and electric motor drive. The condenser shall be designed, fitted, and rated in compliance with recommendations and requirements of ARI 460, ASHRAE 20, and UL 207. Sizing of condenser shall be based on a temperature difference between entering outside air and condensing refrigerant not exceeding 30 F. The saturated refrigerant condensing temperature shall not be over 130 F.

2.1.2 Electric Motor shall be totally enclosed type located within the enclosure and fully protected from the weather. Motor starter shall be magnetic across the line type with general purpose enclosure. Thermal overload protection shall be the manual reset type.

2.1.3 Housing shall be fabricated from sheet carbon steel complying with ASTM A 569.

2.1.4 Refrigerant Piping shall be hard drawn copper, Type L, refrigeration grade complying with ASTM B 75. Valves shall be of brass construction, diaphragm packless or back seating type, specifically designed for refrigeration service.

2.2 Water-Cooled Condensers:

2.2.1 New Condensers shall be of shell-and-tube construction. The condenser shall be designed, fitted, and rated in compliance with the recommendations and requirements of ARI 450, ASHRAE 22, and UL 207. The condenser shall be constructed in compliance with Section VIII of ASME Boiler and Pressure Vessel Code.

2.2.2 Refrigerant Receiver shall comply with Sections II and VIII of the ASME Boiler and Pressure Vessel Code.

2.2.3 Condenser materials for repairs shall be in compliance with Section II of the ASME Boiler and Pressure Vessel Code.

2.2.4 Condenser Tubes shall be fabricated of seamless copper tubing with integral fins, and the tubes shall be individually replaceable and rolled or brazed into the tube sheets of the shell-and-tube unit. The entire bundle shall be removable on shell-and-coil units.

3.0 EXECUTION:

3.1 Condensers shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.2 Condenser Tubes shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.3 Welding and Brazing shall be performed in compliance with AWS D1.1 and Section IX of the ASME Boiler and Pressure Vessel Code.

3.4 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.



SECTION 15680 REFRIGERANT EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigerant equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Performance Ratings: The performance rating of each item of the new refrigerant equipment furnished shall comply with the applicable portions of ARI 450, 460, 495, and 590.

2.2 Bearings shall be an exact replacement. Bearing life shall be equal to the bearing to be replaced.

2.2.1 Bearings for reciprocating equipment shall be precision, oil-cooled or babbitted type.

2.2.2 Bearings for centrifugal equipment or rotary screw equipment shall be precision, oil-cooled type.

2.3 Mufflers shall be a hot-gas muffler or an exact replacement as indicated. Muffler shall be able to reduce vibration and noise from pulsation.

3.0 EXECUTION:

3.1 Welding: All welding shall be in compliance with AWS D1.1.

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.

3.3 Controls:

3.3.1 Chiller Controls: Replace, adjust, and recalibrate defective parts and assemblies.

3.3.2 Starter Controls: Replace defective contactors and relays as necessary.

3.3.3 Capacity Controls: Adjust guide vane linkages and actuator control in compliance with the manufacturer's specification.

3.4 Noncondensables: Check accumulation rate of noncondensables in absorption refrigerant equipment for compliance with manufacturer's instructions.



SECTION 15683 REFRIGERATION SPECIALTIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigeration specialties. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Thermostatic Expansion Valves shall be rated and tested in accordance with ASHRAE 17 or ARI 750.

2.2 Filter Driers shall be sealed in-line type or replaceable core type as required. Filter driers shall be tested and rated in accordance with ASHRAE 63 and ARI 710 and shall meet the requirements of UL 207.

2.3 Sight Glasses for moisture and liquid indication shall be UL listed.

2.4 Refrigerants shall be designated in accordance with ASHRAE 34.

3.0 EXECUTION: Installation of all refrigeration equipment shall comply with ASHRAE 15.



SECTION 15711 NATURAL DRAFT COOLING TOWERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of natural draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Cooling Towers shall be constructed in compliance with NFPA 214 and Mil. Spec. MIL-C-16278.

2.2 Wood Towers:

2.2.1 Framework shall be repaired with or constructed of redwood complying with CTI STD-103, or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.2.2 Louvers shall be repaired with or constructed of redwood, Douglas fir or west coast hemlock.

Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.2.3 Water Basin shall be repaired with or constructed of redwood or Douglas fir. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.3 Metal Towers:

2.3.1 Framework shall be repaired with or constructed of carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123.

2.3.2 Louvers shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3.3 Water Basin shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.4 Glass Fiber Towers:

2.4.1 Framework shall be repaired with redwood complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.4.2 Louvers shall be of rigid formed plastic complying with Fed. Spec. L-P-535.

2.4.3 Water Basin shall be repaired or constructed of redwood or Douglas fir or of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

3.0 EXECUTION:

3.1 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.

3.2 Welding and Brazing shall be performed in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520. **3.4 Testing:** Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, and with CTI ATC-105 and ASME PTC 23 for field performance.



SECTION 15712 FORCED DRAFT AND INDUCED DRAFT COOLING TOWERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of forced draft and induced draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Cooling Towers shall be constructed in compliance with NFPA 214. Fire hazard rating for plastic impregnated materials shall not exceed 25. Plastic shall not drip or run during combustion. Determine ratings by ASTM E84 or NFPA 255.

2.2 Wood Towers:

2.2.1 Louvers shall be redwood, complying with CTI STD-103 or Douglas fir or hemlock complying with CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.2.2 Fill or Contact Surface shall be redwood, complying with CTI STD-103, or Douglas fir or hemlock complying with CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.2.3 Drift Eliminators shall be redwood, complying with CTI STD-103, Douglas fir or hemlock complying with CTI STD-114, or rigid formed plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.

2.2.4 Water Distribution Basin shall be redwood, complying with CTI STD-103 or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.2.5 Water Collection Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.

2.2.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123.

2.2.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3 Metal Towers:

2.3.1 Louvers shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3.2 Fill or Wet Deck shall be carbon steel in compliance with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525, rigid formed plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84, or stainless steel complying with ASTM A 167.

2.3.3 Drift Eliminators shall be carbon steel, complying with ASTM A 366 and galvanized in compliance with ASTM A 525, rigid plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84, or stainless steel complying with ASTM A 167.

2.3.4 Water Distribution Basin shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

2.3.5 Water Collection Basin or Pan shall be carbon steel, complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525 or stainless steel complying with ASTM A 167.

2.3.6 Framework shall be carbon steel, complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123; or stainless steel complying with ASTM A 167.

2.3.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525; or stainless steel complying with ASTM A 167.

2.4 Glass Fiber Towers:

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2.4.1 Louvers shall be formed rigid plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84.

2.4.2 Fill shall be rigid plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84.

2.4.3 Drift Eliminators shall be formed rigid plastic complying with ASTM D 1784, Type 1, Grade 1 with flame spread rating of 15 or less per ASTM E84.

2.4.4 Water Distribution Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.

2.4.5 Water Collection Basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.

2.4.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment complying with CTI WMS-112.

2.4.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.

3.0 EXECUTION:

3.1 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.

3.2 Welding shall be performed in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.

3.4 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, CTI ATC-105, and ASME PTC 23, for field performance.



SECTION 15751 COILS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coils. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pressures:

2.1.1 Water Coil Design Working Pressure shall be 200 psig.

2.1.2 Steam Coil Design Working Pressure shall be 200 psig steam.

2.1.3 Each Replacement Water or Steam Coil shall be hydrostatically tested at 250 psig at the factory.

2.1.4 Each Replacement Direct Expansion Coil shall be pneumatically tested at the factory under water at not less than 300 psig. Each coil shall be completely dehydrated and sealed at the factory upon completion of pressure tests.

2.2 Water, Steam, and Direct Expansion Coils:

2.2.1 Tubing shall be round, seamless, copper tubing, complying with ASTM B 75.

2.2.2 Fins shall be aluminum or copper.

2.2.3 Coil Casing shall be made of galvanized sheet steel complying with ASTM A 526, minimum thickness of 14 gauge.

2.2.4 Water or Steam Coil Headers shall be fabricated from steel pipe complying with ASTM A 53, Grade B; extra heavy seamless copper tubing complying with ASTM B 75; or semisteel complying with ASTM A 126, Class C.

2.2.5 Direct Expansion Coil Headers shall be fabricated from extra heavy seamless copper tubing complying with ASTM B 75.

2.2.6 Each Water Coil shall be provided with a plugged vent tap and drain tap.

2.2.7 Each Steam Coil shall be provided with a vacuum breaker.

2.3 Electrical Heating Coils (and Heat Strips):

2.3.1 Resistance Wire shall be nickel-chromium wire.

2.3.2 Tubular Sheath shall be corrosion-resisting in the surrounding medium and suitable for the temperatures required by the particular application.

2.3.3 Insulating Material shall be densely packed, high purity magnesium oxide.

2.3.4 Insulator Supports for directly exposed elements shall be ceramic or porcelain.

2.3.5 Grid and Heat Strip Elements shall have the resistance wire surrounded by the insulation material and enclosed within the tubular sheath. The sheath shall be imbedded and completely sealed within the cast aluminum grid. Electrical terminals shall project through the cast aluminum grid and shall be designed to minimize the entrance of atmospheric moisture into the heating element.

2.3.6 Heat Strip Element resistance wire shall be uniformly spaced along the length of the sheath.

3.0 EXECUTION:

3.1 Fins shall be mechanically bonded or soldered to the tubes. Tubes shall be rolled and bushed, brazed, or welded to headers. Where required, multiple type supports shall be provided to prevent tube sag. The fin tube and header section shall float within the casing to allow free expansion.

3.2 Removing, Saving, Testing, Cleaning, and Recharging Refrigerants:

3.2.1 Refrigerant in a system in which the coil is to be repaired or replaced shall be removed, saved, and reused in recharging the system. When repair or replacement of the coil has been completed, the refrigerant system shall be pressure-tested and recharged with refrigerant.

3.2.2 The Repaired Coil shall be pressure-tested to 300 psig with dry nitrogen and allowed to stand for 24 hours with no pressure drop after repair or replacement of the coil. Then evacuate the system and/or coil with a vacuum pump capable of pulling 1 mm Hg vacuum absolute. Operate the vacuum pump until a vacuum of 2.5 mm Hg absolute is reached. After evacuation, recharge the system with the refrigerant

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previously removed. Recharge the refrigerant back into the system through a filter drier with capacity capable of removing foreign materials and moisture in the amount of refrigerant removed. The system shall be replenished with refrigerant to provide a fully charged system.

3.2.3 If the system has lost its full charge of refrigerant, a new suction line and liquid line filter drier, sized as recommended by the condenser manufacturer, shall be provided and the system pressure tested, evacuated, and recharged with refrigerant as specified above.

3.3 Welding shall be in compliance with AWS D1.1.

3.4 Brazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.

3.5 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.

3.6 Testing: Hydrostatically test repaired water and steam coils at 1-1/2 times the maximum working pressure.



SECTION 15760 STEAM AND HOT WATER UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steam and hot water unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Unit Heaters shall comply with the requirements of AMCA 99 and 210; NFPA 70; and UL Electrical Construction Materials Directory.

2.2 Coils:

2.2.1 Coils shall be constructed of round seamless copper tubing complying with ASTM B 75, mechanically or hydraulically bonded or expanded into fins constructed of copper or of aluminum complying with ASTM B 209. Tube joints shall be made with high temperature brazing alloys complying with ASTM E 56.

2.2.2 Coil Headers shall be fabricated from seamless carbon steel pipe complying with ASTM A 53, extra heavy seamless copper tubing complying with ASTM B 75 or B 251, or semi-steel complying with ASTM A 126, Class C. **2.3** Housings shall be fabricated from sheet steel complying with ASTM A 569 of a thickness and of sufficient strength to ensure rigidity. Unit heater housings shall be provided with means of suspension or floor mounting as required.

2.4 Fan and Drive:

2.4.1 Propeller and Centrifugal Fans shall be fabricated of aluminum or steel.

2.4.2 Centrifugal Fan Shaft shall be sized for maximum fan speed.

2.4.3 Fan Bearings on belt-driven units shall be self-aligning, permanently lubricated, or the periodic lubricating type with accessible lubricating means. Bearings shall be designed to withstand radial and thrust working loads.

2.5 Controls: Unit heaters shall be furnished with unit-mounted line voltage thermostats to provide ON/OFF fan control.

3.0 EXECUTION:

3.1 Welding shall be in compliance with AWS D1.1.

3.2 Brazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint complying with ASTM D 520.



Section 15765 Cleaning Of Heat Exchangers

1.0 DESCRIPTION OF WORK: This specification covers the cleaning of heat exchangers. Products and materials used shall be in accordance with the heat exchanger manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the heat exchanger manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 Equipment required for cleaning such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizing tank and pump, power brushes, power cutters, and other related items shall be supplied by the Contractor.

2.2 Chemical Cleaning Materials:

2.2.1 Acid Cleaning Chemicals shall be hydrochloric acid complying with Fed. Spec. O-H-765, ammonium bifluoride NH_4HF_2 , and sulfuric acid complying with Fed. Spec. O-S-809.

2.2.2 Neutralizing Chemicals shall be one percent soda ash solution complying with ASTM D 458 and one percent caustic solution complying with ASTM D 456.

2.2.3 Flushing Water shall be potable having not more than 1,000 ppm total solids.

2.3 Mechanical Cleaning Materials and Equipment:

2.3.1 Hot Water shall be used for high velocity wash.

2.3.2 Powered Brushes shall be of the type for use with power units.

2.3.3 Nylon Brushes shall be of the type blown with high pressure water.

3.0 EXECUTION:

3.1 General: Clean heat exchangers of all scale and deposits. Straighten and clean fins on finned tubes.

3.2 Inspection: After heat exchanger cleaning operation, tubes will all be given a visual inspection by the Contracting Officer for effectiveness of scale removal.

3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operation.

3.4 Acid Wash Time may vary from four to eight hours depending on scale analysis. Time shall represent actual retention of the solvent in the unit, including filling and draining time.

3.5 Effluent Neutralization: Solvent effluent drained from the unit shall be neutralized with caustic in compliance with ASTM D 456 or soda ash in compliance with ASTM D 458, to a pH of 6.8 to 8.5.



SECTION 15780 AIR DEHYDRATION EQUIPMENT (ADHE)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air dehydration equipment. **The AdhE consists of two components. The Air Dehydration Unit (ADU) and the Air Distribution Equipment (ADE).** Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufactures recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The equipment provided shall be of sufficient capacity to establish, control and maintain a preservation environmental with a daily average of less than 50 o/o relative humidity 100 o/o percent of the time. The ADU shall be capable of establishing initial relative humidity levels within 96 hours of startup and thereafter returning the application to established standards within 24 hours. Equipment shall be sized for the specific facility and consist of components with sufficient capacity to evenly distribute dehumidified air to all areas of the preservation area.

2.1 ADU/ADE shall be of a type proven in satisfactory operation for a minimum of ten years. Dehumidifier shall be of the non-cycling sorption type with single desiccant, rotary structure. The casing shall be fabricated as a unitized body with welded aluminum construction for maximum strength and durability. Suitable access panels on both sides of the unit shall allow access for inspection or servicing without disconnecting ducting or electrical wiring. Airflow balancing dampers to be furnished. The ADU/ADE shall be designed for continuous operation. The rotary structure shall be a monolithic fabricated extended surface composite consisting of inert silicates reinforced with uniform diameter glass fibers for maximum strength. The fabricated structure shall be smooth and continuous in the direction of the airflow without interruptions or sandwich layers which restrict airflow or create a leakage path at joining surfaces. Desiccant shall not channel, cake or fracture due to repeated temperature and moisture cycling. The materials of construction shall be non-toxic.

Design shall be modular in approach to readily allow connection to accessories such as face and bypass, pre- or post cool modules. Electrical components shall be UL recognized and wiring methods in accordance with the latest edition of the National Electric Code. Full face contact pressure seals shall be provided to separate the process and reactivation airstreams and eliminate detrimental leakage of air or moisture with static pressure differentials of up to 8" of water gauge. ADU/ADE shall be factory assembled, fully automatic complete with laminar flow desiccant wheel, reactivation heaters, reactivation energy control system, roughing filters, motors, fans, non-ratcheting desiccant rotor drive unit, automatic controller and all components auxiliaries. Dehumidifier shall be functionally tested at the manufactures factory and shipped complete with all components necessary to maintain normal operation.

2.2 The ADU/ADE shall be capable of reliable operation within an ambient temperature range of -40F to 120F. In the event of a power failure the ADU shall have the capability to automatically restart immediately after restoration of power.

2.3 ADU shall have the capacity to operate on natural gas L.P. or electric. ADU shall be provided with a monitoring system to determine if the unit is functioning properly.

2.4 Monitor System: Provide full time local automated control system for the ADU/ADE that will show performance data and record temperature, relative humidity and any alarm conditions and provide graphical plot of performance. Provide a safety override that will shut down the ADU if carbon based gases come in contact in excess of 10 percent of the lower explosive limit. The ADU/ADE unit shall shut off when overhead doors are opened.

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2.5 ADU/ADE Supporting Components: The ADU/ADE units shall be a complete package units, supporting components such as ductwork, connectors, reducers, airflow directors, baffles, flexible hose, PVC pipe, mounting hardware, utility connections, are not part of the package units.

2.6 Warranty ADU/ADE equipment shall have a three year warranty. When used, desiccant wheel rotor, silica gel, solid media and corrugated desiccant rotors shall be warranted for 5 years. If the ADU utilizing different technology is used, it shall provide equivalent warranty.

3.0 EXECUTION: ADUs shall be mounted and employed in such a manner as to the maximize space utilization while providing best protection to the ADU and the ADU performance. Sufficient access shall be provided to the ADU for maintenance and operational requirements. All **connectors** and airflow devices shall be located so as to prevent damage while moving equipment in the preservation area.



SECTION 15781 PACKAGED HEATING AND COOLING UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heating and cooling units, including through-wall, roof top, and computer room type units with electrical heat. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI 240 and 270.

2.2 Casing shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation and the compressor compartment shall have acoustical insulation.

2.3 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit.

2.4 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at the factory at 1.5 times the working pressure.

2.5 Filters shall be 2-inch thick throwaway type.

2.6 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.

2.7 Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.

2.8 Humidifier of the infrared type shall be provided for computer room type units.

3.0 EXECUTION:

3.1 Welding shall be performed in accordance with AWS D1.1 and/or ASME Boiler and Pressure Vessel Code, Section IX.

3.2 Brazing shall be performed in accordance with ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Damage to Galvanized Coatings shall be repaired with paint complying with ASTM D 520.



SECTION 15782 PACKAGED HEAT PUMPS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heat pumps, including through-wall and roof top type units with supplemental electric heat. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI 240 and 270.

2.2 Casings shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation, and the compressor compartment shall have acoustical insulation.

2.3 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit. Refrigerant accessories shall include a reversing valve and suction line oil/gas accumulator.

2.4 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at 1.5 times the working pressure.

2.5 Filters shall be 2-inch thick throwaway type.

2.6 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.

2.7 Auxiliary Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.

2.8 Controls shall provide for automatic switchover between cooling and heating cycles.

3.0 EXECUTION:

3.1 Welding shall be performed in accordance with AWS D1.1 and/or ASME Boiler and Pressure Vessel Code, Section IX.

3.2 Brazing shall be performed in accordance with ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Damage to Galvanized Coatings shall be repaired with paint complying with ASTM D 520.



SECTION 15800 HUMIDITY CONTROL EQUIPMENT

1.0 DESCRIPTION OF WORK: This section covers the furnishing and installation of humidifiers and dehumidifiers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Humidifiers shall be pneumatic modulating type.

2.1.1 Steam Separator shall be designed to remove water droplets and particles larger than 3 microns when humidifier is operating at full capacity.

2.1.2 Control Valve shall be stainless steel plug type with pneumatic operator.

2.1.3 Distribution Manifold shall provide uniform dry steam distribution throughout its entire length.

2.1.4 Strainer shall be Y-type.

2.1.5 Steam Trap shall be as recommended by the manufacturer of the steam humidifier and shall be preceded by a drip leg.

2.2 Dehumidifiers shall be free-standing self-contained plug-in type units that are UL listed.

2.2.1 Components shall be housed in a portable 22-gauge steel cabinet.

2.2.2 Capacity Ratings shall be in accordance with AHAM DH-1. Overflow cutoff control shall be provided.

3.0 EXECUTION:

3.1 Steam Supply Manifold for humidifier shall be installed either perfectly level or extending upward vertically in duct. Discharge holes shall point upstream against airflow.

3.2 Welding shall be performed in accordance with AWS D1.1 and ASME Boiler and Pressure Vessel Code, Section IX, where applicable.



SECTION 15830 RADIATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of radiators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Radiators shall comply with AGA Directory of Certified Appliances and Accessories; IBR Testing and Rating Code for Finned Tube (Commercial) Radiation, if applicable; NFPA 70; and UL 499 or UL 795, as applicable.

2.2 Cast-Iron Radiators:

2.2.1 Core shall be small tube section constructed of cast iron complying with ASTM A 48.

2.2.2 Core Sections shall be assembled with malleable iron or polytetrafluoroethylene coated steel push nipples.

2.3 Baseboard-Fintube Radiators:

2.3.1 Nonferrous Fintube shall be fabricated of seamless copper tubing, complying with ASTM B 75 and mechanically expanded into aluminum fins.

2.3.2 Ferrous Fintube shall be fabricated of steel pressure tubing complying with ASTM A 450 and mechanically expanded into fins of steel sheet complying with ASTM A 568.

2.3.3 Enclosure, Dampers, and Element Supports shall be fabricated from carbon steel complying with ASTM A 568.

2.4 Radiant Radiators:

2.4.1 Gas Plenum shall be carbon steel with a porcelain enameled finish complying with ASTM A 424 and Fed. Spec. PPP-P-600, or galvanized in compliance with ASTM A 526.

2.4.2 Air Mixer shall be carbon steel with a corrosion-resistant finish complying with ASTM A 526 or ASTM A 568.

2.4.3 Venturi shall be carbon steel complying with ASTM A 526 or ASTM A 568 with a corrosion-resistant finish.

2.4.4 Enclosure shall be carbon steel complying with ASTM A 526 or ASTM A 568.

2.5 Convectector Radiators:

2.5.1 Electric Heating Element shall be constructed of nickel chromium wire enclosed within a metal sheath and electrically insulated in the sheath with a densely compacted refractory material.

2.5.2 Hydronic/Steam Heating Elements shall be constructed of seamless copper tubing complying with ASTM B 75 mechanically expanded into aluminum fins. The tube and fin assembly shall be encased in a frame of steel complying with ASTM A 568. Tube headers shall be steel or brass joined to the tubes by high temperature brazing alloys complying with ASTM E 56.

2.5.3 Enclosure, Dampers, Element Supports, and Access Doors (when applicable) shall be fabricated from carbon steel complying with ASTM A 568.

3.0 EXECUTION:

3.1 Welding shall be performed in accordance with AWS D1.1.

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint complying with ASTM D 520.



SECTION 15840 INDUCTION UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of induction units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Induction Units shall include cabinet, primary air plenum with inlet collar, air balancing damper, multi-stage nozzles, coil, drain pan, and discharge stack. Units shall be tested and rated at the factory in accordance with ARI 445.

2.2 Cabinet and Primary Air Plenum shall be constructed of or repaired with 24 gauge galvanized steel with die-cast support frame members. Plenum shall be lined with 3/8-inch thick, 25-pound density insulation, black plastic bonded fiberglass, mat-faced.

2.3 Nozzles shall be provided in vertical strips, precision-molded from heat-resistant thermoplastic material. Nozzles shall be designed for temperature range encountered with pressures up to 3-1/2 inch wg. Nozzle strips shall be mechanically sealed and locked to nozzle frame.

2.4 Dampers shall be multiple-hole design and shall extend the full length of the plenum. Adjustment shall be provided by manual push-pull operator located next to the primary air inlet.

2.5 Coils shall be designed for 300 psi working pressure.

3.0 EXECUTION:

3.1 Induction Units shall be installed level, using shims if required, and anchored to the floor.

3.2 Damage to Galvanized Coatings shall be repaired in compliance with ASTM D 520.

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SECTION 15855 AIR HANDLING UNITS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air handling units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Built-up air handling units (AHUs) shall consist of casings, fan sections, coils, filter boxes, mixing boxes, dampers, and other equipment as required. All AHUs shall be certified in accordance with ARI 430. Coils shall be certified in accordance with ARI 410. Electric heating coils shall meet the requirements of UL and the National Electric Code. AHUs shall also conform to the requirements of NFPA 90A and all applicable SMACNA standards.

3.0 EXECUTION:

3.1 Air Handling Units shall be installed to conform with NFPA 90A and applicable SMACNA standards.

3.2 Welding shall be performed in compliance with AWS D1.1.



SECTION 15860 CENTRIFUGAL FANS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of centrifugal fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Fan Performance:

2.1.1 New Fans shall comply with AMCA 210, 300, and 301.

2.1.2 Capacity and Performance of New or Repaired Fans shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.2 Fan Wheel and Shaft:

2.2.1 Aluminum Fan Wheels shall comply with Fed. Spec. QQ-A-596. Fan wheels for wall exhaust fans shall be constructed of aluminum complying with ASTM B 209. Steel for the fan wheels shall comply with ASTM A 366.

2.2.2 Fan Shaft shall be turned, ground, and polished carbon steel alloy.

2.2.3 Fan Shaft shall be tubular with swaged ends accurately finished.

2.3 Fan Housing:

2.3.1 Fan Housing shall be carbon steel sheet complying with ASTM A 569, except wall exhaust fan housings shall be spun aluminum complying with ASTM B 209.

2.3.2 When the fan discharge of the existing housing to be replaced is changeable, discharge of the new housing shall be easily changed in compliance with AMCA 99.

2.4 Inlet Boxes: Steel for repairs shall be carbon steel sheet complying with ASTM A 569.

2.5 Bearings:

2.5.1 Precision Antifriction Bearings shall comply with ABEMA 9 and ABEMA 11.

2.5.2 Sleeve Bearings shall be self-aligning sleeve bearings.

2.5.3 Roller Bearings shall be self-aligning, high load capacity, grease-lubricated, heavy-duty, pillow block type.

2.5.4 Wall Exhaust Fan Bearings shall be sealed-in lubrication, antifriction type adequate for both radial and thrust loads occurring in the mounting.

2.6 Fan Belts shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only.

2.7 Insulation in fan housing shall be mineral fiber complying with ASTM C 553 TYPE 1 CLASS B-4.0. Adhesive shall be fire resistive adhesive complying with ASTM C 916.

3.0 EXECUTION:

3.1 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically.

3.2 Welding shall be performed in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair point in compliance with ASTM D 520.

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SECTION 15865 AXIAL FLOW FANS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of axial flow fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. New fans shall comply with AMCA 210, 300, and 301.

2.2 Fan Wheel repair material shall be sheet aluminum complying with ASTM B 209. New wheels shall be of airfoil design and shall be statically and dynamically balanced at the factory.

2.3 Fan Shafts shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.

2.4 Fan Housing shall be 22 gauge, welded carbon steel complying with ASTM A 569.

2.5 Propeller Guards, when required, shall be sheet metal complying with ASTM A 366 or hot-dip galvanized were complying with ASTM A 641.

2.6 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust loads occurring in the mounting.

2.7 Fan Belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only. Belt guards shall comply with OSHA.

2.8 Insulation in fan housing shall be mineral fiber complying with ASTM C553, Type 1, Class B-4.0. Adhesive shall be fire resistive adhesive complying with ASTM C916.

3.0 EXECUTION:

3.1 Welding shall be performed in compliance with AWS D1.1.

3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair in compliance with ASTM D 520.



SECTION 15871 POWER ROOF VENTILATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of power roof ventilators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 PRV Performance:

2.1.1 New PVRs shall comply with AMCA 210, 300, and 301.

2.1.2 Capacity and Performance of new and repaired PRVs shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.2 Fan Wheel shall be centrifugal, axial flow, or turbine type, non-overloading, constructed of aluminum complying with ASTM B 209.

2.3 Fan Shaft shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.

2.4 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust load occurring in the mounting.

2.5 Fan Housing shall be spun aluminum complying with ASTM B 209. The housing shall be weatherproof with 360 degrees discharge air pattern.

2.6 Fan Belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only.

2.7 Insulation in fan housing shall be mineral fiber complying with ASTM C553, Type 1, Class B-4. Adhesive shall be fire resistive adhesive complying with ASTM C916.

2.8 Roof Curb shall be prefabricated, with continuous welded water-tight seams. The curb shall be of the roofed-over, flashing type, with built-in cant strip.

2.9 Back Draft Dampers for installation in the roof curb shall be multiple blade type, constructed of aluminum complying with ASTM B 209.

3.0 EXECUTION:

3.1 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically. Propeller fans shall be statically balanced.

3.2 Welding shall be performed in compliance with AWS D1.1.

3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint in compliance with ASTM D 520.

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SECTION 15881 DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of diffusers, registers, grilles, and louvers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Supply Air Ceiling Diffusers shall be constructed of aluminum or steel and shall be furnished with volume control dampers. Provide ceiling-mounted diffusers with rubber gasket sponge and ceiling frames for anti-smudging protection.

2.2 Supply Air Slot Diffusers for sidewall, sill, or floor mounting shall have 1/2-inch bar spacing with 0 degrees or 15 degrees deflection. Construction shall be extruded aluminum. Furnish with volume control damper.

2.3 Return Air Registers shall be constructed of aluminum or steel and shall be furnished with opposed blade volume control dampers.

2.4 Return Air Ceiling Registers shall be constructed of aluminum with aluminum or plastic egg crate grille.

2.5 Grilles shall be as specified for registers, without volume control damper.

2.6 Louvers shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible. Louvers shall be constructed of aluminum or steel and shall be furnished with birdscreens. Louvers shall bear the AMCA Certified Ratings Seal for air performance and water penetrations ratings as described in AMCA 500.

2.7 Inlets and Outlets shall be sound rated and certified in accordance with ADC 1062R4 in sound power level, dB referenced to 10 to the minus 12 watt, in octave bands 2 through 8. Performance shall be certified in accordance with ADC 1062R4.

2.8 Inlets and Outlets shall follow recommended noise levels as stated in SMACNA Manual for HVAC Systems Duct Design.

3.0 EXECUTION: Diffusers and registers shall be installed in accordance with applicable SMACNA Standards.

3.1 Return Air Registers/Grilles shall be similar to supply air registers/diffusers when applicable.



SECTION 15886 AIR CLEANING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air cleaning devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Throwaway Panel Filters shall be constructed of glass, paper, or fabric media with a UL listing of Class 2 and shall be 1 or 2 inches thick as required. The filters shall have an initial resistance not greater than 0.30 inch w.g. at a face velocity of 500 fpm.

2.2 Extended Surface Self-Supporting Filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media, integral media support, and a rigid galvanized steel frame. Nominal thickness shall be 12 inches. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.

2.2.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.50 inch w.g. at 500 fpm face velocity.

2.2.2 Filters Rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.60 inch w.g. at 500 fpm face velocity.

2.2.3 Filters Rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.70 inch w.g. at 500 fpm face velocity.

2.3 Extended Surface Non-Supported Filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media. Individual bags shall be retained by a galvanized steel frame. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.

2.3.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.35 inch w.g. at 500 fpm face velocity.

2.3.2 Filters Rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.45 inch w.g. at 500 fpm face velocity.

2.3.3 Filters Rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.55 inch w.g. at 500 fpm face velocity.

2.4 Automatic Renewable Roll Filters shall be constructed of 2-inch thick, viscous-coated, UL-listed Class 1 or Class 2 fibrous media. Filter initial resistance shall be not greater than 0.50 inch w.g. at 500 fpm face velocity. Filter efficiency shall be 80-85 percent when tested in accordance with ASHRAE 52.

2.5 Permanent Washable Panel Filters shall consist of galvanized steel media and frames, 1-inch or 2-inch thickness as required. Filters shall have an initial resistance not greater than 0.10 inch w.g. at 500 fpm face velocity.

2.6 HEPA Filters shall be constructed of UL-listed Class 1 glass fiber media sealed in a rigid casing. Filters shall be rated by the DOP Test Method on 0.3 micron particles. Filter initial resistance shall not be greater than 1.0 inch w.g. for the rated airflow. Filters shall be furnished complete with necessary gaskets.

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2.6.1 Filter Rated for 150 fpm Face Velocity with 95 percent DOP efficiency; 6-inch filter depth.

2.6.2 Filter Rated for 250 fpm Face Velocity with 95 percent DOP efficiency; 12-inch filter depth.

2.6.3 Filter Rated for 150 fpm Face Velocity with 99.99 percent DOP efficiency; 6-inch filter depth.

2.6.4 Filter Rated for 250 fpm Face Velocity with 99.99 percent DOP efficiency; 12-inch filter depth.

2.7 Activated Carbon Filters shall be constructed of epoxy-coated perforated steel trays containing the activated carbon. Individual trays shall mount in a gasketed side access housing. The unit shall have an initial resistance of 0.35 inch w.g. at 500 fpm face velocity.

2.8 Electronic Aircleaners shall consist of an electrostatic agglomerator section and a renewable fibrous glass collector. The unit shall provide a dustspot efficiency of 90 percent at 500 fpm face velocity. Typical operating resistance shall be 0.40 inch w.g.

2.9 Dust Collectors shall be the dry centrifugal type complete with integral blower, dust separator, and hopper.

3.0 EXECUTION: Install filters in accordance with applicable sections of NFPA 70, 90A, and 90B.



Section 15887 Tailpipe Exhaust Equipment

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tailpipe exhaust equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Capacity and Performance shall be based on standard air density (0.075 pound per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.

2.2 Blowers and Accessories shall comply with AMCA 210, 300, and 301. Fan impellers shall be constructed of heavy gauge steel and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or other material suitable to resist the corrosive gases and temperatures encountered. Fans to be mounted on exterior of building shall be provided with weatherproof covers.

2.3 Exhaust Duct and Fittings for vehicle tailpipe exhaust systems shall be constructed of galvanized sheet steel. Sheets shall conform to ASTM A 525. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA Duct Construction Standards - Metal and Flexible.

2.3.1 Tailpipe Adapter shall be not less than 20-gauge corrosion-resisting steel. The adapter shall be of the tapered cone type with spring clip or other suitable device for exhaust pipe attachment.

2.3.2 Flexible Exhaust Tubing shall be 0.012 minimum thickness galvanized sheet steel or heat-resistant, reinforced wire, fiberglass, and neoprene tubing.

2.3.3 Dampers shall be of the circular disk type with quadrant locking device or blast gate type.

2.3.4 A Flexible Tubing Suspension System shall be furnished and installed for repaired tailpipe exhaust systems where no such suspension system exists. The flexible tubing suspension system shall suspend the flexible tubing overhead when not in use, allowing it to be lowered to the operating level, when required. The suspension system installed shall be complete with cable, pulleys, and operating mechanism.

3.0 EXECUTION:

3.1 Ductwork joints in galvanized sheet steel ductwork shall be soldered or otherwise sealed. The lock seam in straight sections shall be located on top of the duct. Seams shall be suitable for 10-inch water gauge static pressure. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA Duct Construction Standards - Metal and Flexible.

3.2 Weather-Resistant Finishes of items located outdoors shall meet the requirements of ASTM B 117.



SECTION 15890 DUCTWORK AND ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Duct and Equipment Casings, Housing, and Plenums shall be fabricated in accordance with SMACNA Duct Construction Standards – Metal and Flexible and shall comply with NFPA 90A, 90B, and 91. Metal gauge shall generally be in accordance with SMACNA standards but in no case shall be less than existing duct gauge.

2.1.1 Galvanized Steel shall comply with ASTM A 527 and with ASTM A 525 for zinc coating.

2.1.2 Black Steel shall comply with ASTM A 569.

2.1.3 Aluminum shall comply with ASTM B 209.

2.1.4 Stainless steel shall comply with ASTM A 167.

2.2 Fibrous Glass Duct shall be fabricated in accordance with SMACNA Fibrous Glass Duct Construction Standards.

2.3 Flexible Duct shall be in accordance with NFPA 90A and SMACNA Duct Construction Standards - Metal and Flexible and shall be UL listed.

2.4 Flexible Connectors shall be in accordance with NFPA 90A and shall be UL listed.

2.5 Sealants shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible.

2.6 Hangers and Supports shall be constructed of galvanized steel or other corrosion-resistant material in accordance with SMACNA Duct Construction Standards - Metal and Flexible.

2.7 Ductwork Accessories shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible.

2.8 Paint for Repair of Galvanized Surfaces shall comply with ASTM D 520.

3.0 EXECUTION:

3.1 Ductwork: Damaged sections of duct shall be repaired by patching or by replacing complete sections. Work shall comply with the applicable sections of SMACNA Duct Construction Standards - Metal and Flexible, and NFPA 90A, NFPA 90B, or NFPA 91.

3.2 Flame Cutting: No cutting by torch or flame shall be done without authorization from the Contracting Officer.

3.3 Welding shall be performed in compliance with AWS D1.1.

3.4 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.



SECTION 15915 CONTROL AND FIRE DAMPERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control and fire dampers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New Control Dampers may be of parallel or opposed blade design and shall be tested in accordance with the requirements of AMCA 500 for the specific performance characteristics required. Construction shall be in accordance with the requirements of SMACNA construction standards, as well as ASHRAE recommendations pertaining to construction of duct accessories.

2.2 New Fire Dampers may be of single blade, multi-blade, or curtain design and shall be tested in accordance with the requirements of UL 555. Fire dampers shall be UL listed and/or FM approved for their intended use. Fire dampers shall also conform to the requirements of the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

3.0 EXECUTION:

3.1 Control Damper Installation and Repair Work shall be in compliance with applicable portions of details of construction, as shown in ASHRAE and SMACNA standards.

3.2 Fire Damper Installation and Repair Work for dampers in air conditioning and ventilating duct openings, through walls and floors, shall be in compliance with the requirements of NFPA 90A and the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems. Fire damper installation and repair work for dampers in wall openings without ducts shall be repaired or replaced in compliance with the requirements of NFPA 80, when such openings are not passageways.

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SECTION 15920 SOUND ATTENUATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound attenuators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Sound attenuators shall be constructed of galvanized steel with acoustical baffle as required to provide the desired attenuation. Methods for presenting sound attenuation data shall be consistent with the ASHRAE Handbook Series.

3.0 EXECUTION: Installation shall comply with the SMACNA duct construction standards.



SECTION 15951 CONTROL DEVICES FOR MECHANICAL EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control devices for mechanical equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Controls may include sensors, transducers, controllers, controlled devices, and other accessories as required. Typical items include thermostats, humidistats, aquastats, controllers, control valves, dampers, specialized control packages, air supply packages, tubing, control wiring, and panels. Where a complete control system is replaced, all new control components shall be by the same manufacturer.

3.0 EXECUTION:

3.1 All Control Components other than those located in finished spaces shall be clearly tagged.

3.2 Control Valves shall be mounted horizontally with operator up unless otherwise directed by the Contracting Officer.

3.3 Instrument Air for pneumatic controls shall be clean, dry, oil-free compressed air.

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SECTION 15990 TESTING AND BALANCING OF HVAC SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers testing and balancing of HVAC systems.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Test and Balance Contractor shall be certified by the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC).

3.2 Certified Test Reports shall be submitted by the Contractor to the Contracting Officer. Test reports shall comply with the standards, listed below, of the selected test and balance association.

3.2.1 NEBB-01, Procedural Standards for Testing - Adjusting - Balancing of Environmental Systems.

3.2.2 AABC National Standards for Total System Balance (AABC MN-1).

3.3 Test and Balance Work shall be in accordance with the standards of the selected test and balance association. The work shall also comply with the recommendations of ASHRAE pertaining to instruments, measurements and procedures and with SMACNA-07, HVAC Systems - Testing, Adjusting and Balancing.

3.4 Systems shall be tested at near maximum load conditions. Cooling systems shall be tested in summer; heating systems shall be tested in winter.

3.5 Equipment Settings including dampers, valves, and similar equipment shall be marked to show final positions at the completion of balancing.



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DIVISION 16 ELECTRICAL



SECTION 16032 WIRING SYSTEMS EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of wiring systems equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Copper Wire: Hard-drawn-copper conductors shall comply with ASTM B 1 and ASTM B 8 as appropriate for the conductor size. Conductor material is to be determined by UPB item selected without substitution.

2.1.1 Rated Circuit Voltages All wire and cable shall have minimum rated circuit voltages in accordance with Table 3-1 of NEMA WC 7 or NEMA WC 8.

2.1.2 Conductors shall conform to all the applicable requirements of Section 2 of NEMA WC 7 or Part 2 of NEMA WC 8 as applicable and shall be annealed copper. Copper conductors may be bare, or tin- or lead-alloy-coated, if required by the type of insulation used.

2.1.3 Insulation: Rubber insulation shall comply with NEMA WC3. Thermoplastic insulation shall comply with NEMA WC5. Cross-Linked Polyethylene insulation shall comply with NEMA WC7. Ethylene Propylene Rubber insulation shall comply with NEMA WC8.

2.1.4 Non-metallic Sheathed Cable shall comply with UL 719, type NM or NMC.

2.1.5 SO Cord shall be provided with 60 degree C, 600-volt insulation and "Neoprene" jacket. SO cords shall conform to the applicable requirements of NEMA WC 3, Part 7, paragraphs 7.6 and 7.7, respectively. Conductors shall have not less than class H stranding.

2.1.6 Armored Cable shall comply with UL 4 and NFPA 70, and shall be Type AC cable.

2.2 Aluminum Wire: All-aluminum-conductors, AAC, shall be alloy 1350-H19 and comply with ASTM B 230 and ASTM B 231. All-aluminum-alloy-conductors, AAAC, shall be alloy 6201-T81 and comply with ASTM B 398 and ASTM B 399. Aluminum-conductor-steel-reinforced, ACSR, shall comply with ASTM B 232.

2.3 Busways and Fittings: Busways shall comply with NEMA BU 1 and UL 857 and shall be of the voltage, phase, and continuous current ratings indicated. Busways shall have short-circuit ratings not less than the maximum short-circuit currents of associated transformers, assuming primary sources of infinite capacity. Busways shall be feeder-low-impedance type and of outdoor or indoor service construction as suitable to the location. Busways shall be complete with elbows, fittings, flanges, end-closures, tees, crosses, cable-tap boxes, accessories, and other devices required for the indicated installation, and shall be coordinated for connection to the indicated equipment. For wet/damp locations, bus duct shall be heated, nonventilated enclosure, nonsegregated phase type in accordance with IEEE ANSI/IEEE C37.23. Detail drawings for busway supports and bracing shall be submitted and shall indicate that busways are adequately supported for the seismic zone.



2.4 Plugs and Receptacles: Receptacle service fittings shall have receptacles with configuration and construction in accordance with UL 498 and NEMA WD 1 as applicable. Receptacle dimensions shall comply with NEMA WD 6.

2.5 Conduit: ANSI C80.1, C80.3, and C80.5, NEMA RN 1, and NEMA FB 1.

2.5.1 Rigid Metal conduit shall comply with UL6.

2.5.2 PVC Conduit shall comply with UL651.

2.5.3 Intermediate Metal Conduit (IMC) shall comply with UL 1242.

2.5.4 Reinforced Thermosetting Resin Conduit (RTRC) shall comply with UL1684.

2.5.5 Electrical, Zinc-Coated Steel Metallic Tubing (EMT) UL 797

2.5.6 Electrical Nonmetallic Tubing (ENT) NEMA TC 13

2.5.7 Electrical Plastic Tubing and Conduit NEMA TC 2.

2.5.8 Flexible Conduit, Steel and Plastic General-purpose type, UL 1; liquid tight, UL 360, and UL 1660

2.5.9 Intermediate Metal Conduit UL 1242

2.5.10 PVC Coated Rigid Steel Conduit NEMA RN 1

2.5.11 Rigid Aluminum Conduit ANSI C80.5 and UL 6

2.5.12 Rigid Metal Conduit UL 6

2.5.13 Rigid Plastic NEMA TC 2, UL 651 and UL 651A

2.5.14 Surface Metal Raceways and Fittings: UL 5.

2.6 Electrical Enclosures: General enclosures shall comply with NEMA ICS 6 and OS 1. Power switch gear Assembly enclosures shall comply with NEMA SG 5. Switchboards shall comply with NEMA PB 2. Panelboards shall comply with NEMA PB 1.

2.7 Specific Purpose Wiring Devices: Wiring devices shall comply with NEMA WD 1, and NEMA WD 6 for dimensional requirements of wiring devices.

2.8 General Electrical: The installation shall conform to the requirements of NFPA 70, NFPA 70B and NFPA 101.

2.9 Connectors and Splices: Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition and aluminum-composition to copper shall comply with UL 486B, and copper-to-copper shall comply with UL 486A.

2.10 Conductor Shielding: Conductor shielding conforming to paragraph 2.7 of NEMA WC 7 or NEMA WC 8, as applicable, shall be used on power cables having a rated circuit voltage above 2,000 volts. In

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addition, conductor shielding for shielded cables shall also comply with Section C of AEIC CS5 or AEIC CS6.

2.11 Electrical Duct System: System shall be single or two level types, and shall consist of single, double, or triple duct as indicated. Duct system shall be located in the structural slab and shall comply with the requirements of UL 884.

2.12 Conduit Support: Metallic conduits and tubing, and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Cutting the main reinforcing bars in reinforced concrete beams or joists shall be avoided when drilling holes for support anchors. Holes drilled for support anchors, but not used, shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Cables and raceways shall not be supported by ceiling grids. Except where permitted by NFPA 70, wiring shall not be supported by ceiling support systems. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts when required by NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box. Otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that the wiring system has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the wiring system will not be damaged by the power outage. Re-energization shall be coordinated to ensure equipment will not be damaged.

3.2 Clearances: Working clearances shall comply with NFPA 70.

3.3 Grounding: Grounding shall be in conformance with NFPA 70, and section 16390.

3.4 Wiring Methods: Wiring shall conform to NFPA 70.

3.5 Boxes and Supports: Boxes shall be provided and sized in the wiring or raceway systems as required by NFPA 70.



SECTION 16110 OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of overhead electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conductors: ASTM B 8, ASTM B 228, ASTM B 229, ASTM B 230, ASTM B 231, ASTM B 232, ASTM B 399, ASTM B 416; NEMA WC 5, NEMA WC 7 and NEMA WC 8.

2.2 Insulators: ANSI C29.1, C29.2, C29.3, C29.4, C29.5, C29.6, C29.7, C29.8, C29.9, and NEMA HV 2.

2.3 Poles:

2.3.1 Wood Poles: Wood poles shall comply with ANSI O5.1. Poles shall be pressure treated in accordance with AWP A C4, with creosote conforming to AWP A P1/P13. Oil-borne preservatives and petroleum shall conform with AWP A P8 and AWP A P9, respectively. Waterborne preservatives shall conform with AWP A P5. Waterborne preservatives shall be either chromated or ammoniacal copper arsenate. Any species listed in ANSI O5.1 for which a preservative treatment is not specified in AWP A C4, shall not be used. Northern white cedar, if treated as specified for western red cedar, and western fir, if treated as specified for Douglas fir, may be used. Wood poles shall have pole markings located approximately 10 feet from pole butts for poles 50 feet or less in length, and 14 feet from the pole butts for poles longer than 55 feet in length. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Where poles are not provided with factory-cut gains, metal gain plates shall be provided.

2.3.2 Steel Poles: Steel poles shall be designed to withstand the loads specified in IEEE C2 multiplied by the appropriate overload capacity factors, shall be hot-dip galvanized in accordance with ASTM A 123. Poles shall have tapered tubular members, either round in cross-section or polygonal, and comply with strength calculations performed by a registered professional engineer. Calculations shall be submitted. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, length, and a loading tree. Attachment requirements shall be provided as indicated, including grounding provisions. Climbing facilities are not required. Bases shall be of the anchor-bolt-mounted type. Pole finish shall match existing adjacent poles.

2.3.3 Concrete Poles: Concrete poles shall be designed to withstand the loads specified in IEEE C2 multiplied by the appropriate overload capacity factors. Poles shall be reinforced or prestressed, either cast or spun. Spun poles shall be manufactured by a centrifugal spinning process with concrete pumped into a polished round tapered metal mold. Concrete for spun poles shall have a compressive strength of at least 5000 psi at 28 days. Steel wire shall have an ultimate tensile strength of at least 120,000 psi; and reinforcing bars shall have an ultimate tensile strength of at least 40,000 psi. After the high speed spinning action is completed, a spun pole shall be cured by a suitable wet steam process. Spun poles shall have a water absorption of not greater than three percent to eliminate cracking and to prevent erosion. Concrete poles shall have hollow shafts. Poles shall have a hard, smooth, nonporous surface that is resistant to soil

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acids, road salts, and attacks of water and frost. Poles shall not be installed for at least 15 days after manufacture. Fittings and brackets that conform to the concrete pole design shall be provided. Poles shall conform to strength calculations performed by a registered professional engineer and submitted.

2.4 Crossarms: Crossarms shall comply with RUS REA Bulletin 1728H-701 and shall be solid wood, distribution type, except cross-sectional area with pressure treatment conforming to AWPAC C25, and a 1/4 inch, 45 degree chamfer on all top edges. Cross-sectional area minimum dimensions shall be 4-1/4 inches in height by 3-1/4 inches in depth in accordance with IEEE C2 for Grade B construction. Crossarms shall be 8 feet in length, except that 10 foot Crossarms shall be used for crossarm-mounted banked single-phase transformers or elsewhere as indicated. Crossarms shall be machined, chamfered, trimmed, and bored for stud and bolt holes before pressure treatment. Factory drilling shall be provided for pole and brace mounting, for four pins or four vertical line-post insulators, and for four suspension insulators, except where otherwise indicated or required. Drilling shall provide required climbing space and wire clearances. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length. Bend or twist shall be in one direction only.

2.5 Hardware:

2.5.1 Pole Line Hardware: Zinc-coated hardware shall comply with ANSI C135.1, ANSI C135.2, ANSI C135.4, ANSI C135.14, ANSI C135.22. Steel hardware shall comply with ASTM A 575 and ASTM A 576. Hardware shall be hot-dip galvanized in accordance with ASTM A 153. Pole-line hardware shall be hot-dip galvanized steel, except anchor rods of the copper-molten welded-to-steel type with nonferrous corrosion-resistant fittings shall be used.

2.5.2 Armless Construction: Brackets shall be attached to poles with a minimum of two bolts. Brackets may be either provided integrally as part of an insulator or attached to an insulator with a suitable stud. Bracket mounting surface shall be suitable for the shape of the pole. Brackets for wood poles shall have wood gripping members. Horizontal offset brackets shall have a 5-degree uplift angle. Pole top brackets shall conform to ANSI C135.22, except for modifications necessary to provide support for a line-post insulator. Brackets shall provide strength exceeding that of the required insulator strength, but in no case less than a 2800 pound cantilever strength.

2.5.3 Guy Assemblies Guy assemblies shall be aluminum-clad steel in accordance with ASTM B 416, copper-clad steel in accordance with ASTM B 228 or zinc-coated steel in accordance with ASTM A 475. Guy assemblies, including insulators and attachments, shall provide strength exceeding the required guy strength. Three-eye thimbles shall be provided on anchor rods to permit attachment of individual primary, secondary, and communication down guys. Anchors shall provide adequate strength to support all loads.

2.6 Connectors: UL486A and UL486B.

3.0 EXECUTION:

3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.

3.2 Line Clearing: Chemicals used in line clearing operations shall be in compliance with the latest federal and state requirements.

3.3 Safety Precautions: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.



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SECTION 16111 FIBER OPTIC DATA TRANSMISSION SYSTEM

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for new and/or repair and maintenance of fiber optic data transmission systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS :

2.1 FO Modems: shall be selected to meet FO system requirements. The modems shall allow full duplex, asynchronous, point-to-point digital communication using an FO pair.

2.1.1 FO Modem Operating Wavelength shall be centered on 850, 1330, or 1550 nanometers.

2.1.2 FO Modem Inputs and Outputs FO modems shall accept inputs and provide outputs compatible with EIA ANSI/EIA/TIA-232-E, EIA 485, 20 mA current loop, or T1. Digital data rates through each link shall be as selected.

2.2 FO Transmitter and Receiver Modules:

2.2.1 Analog FO Transmitter and Receiver Modules FO transmitter/receiver pairs used to pass analog video signals shall accept inputs and provide outputs that comply with EIA 170 and shall have a bandwidth of 6 MHz or greater.

2.2.2 Digital FO Transmitter and Receiver Modules FO transmitter/receiver pairs used to pass digital signals shall accept inputs and provide outputs compatible with EIA ANSI/EIA/TIA-232-E, EIA 485, 20 mA current loop, or T1. Digital data rates through each link shall be as specified. FO transmitter and receiver modules shall be compatible with each other, the FO cable, and connectors.

2.2.3 FO Transmitter Module The FO transmitter shall accept electronic signals and shall modulate a light source. The light source shall be coupled into an FO cable. The operating wavelength shall be centered on 850, 1330, or 1550 nanometers.

2.2.4 FO Receiver Module The FO receiver module shall receive light from the FO cable and shall convert this light into an electronic signal identical to the electronic signal applied to the FO transmitter module. The operating wavelength shall be the same as the transmitter.

2.3 FO Digital Repeaters: shall be used to extend the range of the FO data transmission system when necessary to meet the requirements.

2.4 FO Analog Repeaters: shall be used to extend the range of the FO data transmission system when necessary to meet the requirements.

2.5 Transceivers for Video Applications: shall allow bi-directional signal transmission on a single fiber. The operating wavelength shall be centered on 850 nanometers in one direction and centered on 1330 nanometers in the other direction. Crosstalk attenuation between channels shall be 40 dB or greater. FO transceivers shall be selected to match or exceed the highest data rate of attached input devices. The FO transceiver shall be mechanically and optically compatible with the remainder of the FO system.



2.6 Transceivers for FO LAN Applications: shall be active units, compatible with the LAN cards, modems and repeaters used in the system. Indicators provided shall be for power, collision detection, receive, transmit, and status. Power for transceivers shall be derived from the AUI port of LAN equipment or from a dedicated power supply. Transceiver loss characteristics shall be less than 1.0 db. Connectors shall be low loss and compatible with LAN equipment. Circuitry shall be included so when a device is disconnected, other devices on the LAN continue to operate without any disruption.

2.7 FO Switches: shall be single pole, double throw. Switching speed shall be less than 15 milliseconds. Insertion loss shall be less than 1.5 dB. Crosstalk attenuation between FO outputs shall be 40 dB or greater.

2.8 FO Active Star Units: shall provide full-duplex communications in a multi-point configuration. Each unit shall have one input port module and up to four output port modules. FO active star units shall be mechanically and optically compatible with the remainder of the FO system. The star unit shall allow a mixed configuration of port module operating wavelengths and single-mode or multimode FO cables. Each port module shall have a separate FO cable input and output. Port modules shall be connected using an electronic data bus. Port module FO transmitters shall regenerate the optical signal at the transmission rate specified. Port modules shall be rack-mounted in a 19 inch rack complying with EIA ANSI/EIA-310-D. The total propagation delay through the star unit shall be less than 100 nanoseconds.

2.9 Fiber Optic Drop Repeaters (FODR): shall combine the features specified for Fiber Optical Digital Repeaters and Local Area Network (LAN) transceivers. FODRs shall regenerate the optical signal at the transmission rate specified. The FODRs shall be mechanically and optically compatible with the remainder of the Fiber Optic system. FODRs shall restore the optical signals amplitude, timing and waveform. The FODR shall provide an electrical interface to the transmission media. The electrical interface shall be identical to all other network interfaces as specified.

2.10 FO EIA 485 Data Transmission Converters: shall be used to connect equipment using EIA 485 data transmission when necessary and as shown. Converters shall operate full duplex and support two wire circuits at speeds up to 2 megabytes per second and have a built in 120 Ohm terminating resistor. Converters shall be mechanically, electrically, and optically compatible with the system.

2.11 Enclosures: shall meet the requirements of Type 12 or 4X as shown. Enclosures and fittings of every description having hinged doors or removable covers, and which contain any part of the FO circuits or power supplies, shall be provided with cover-operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved.

2.12 System Requirements:

2.12.1 Signal Transmission Format Code FO equipment shall use the same transmission code format from the beginning of a circuit to the end of that circuit. Different transmission code formats may be used for different circuits as required to interconnect supported equipment.

2.12.2 Flux Budget/Gain Margin FO links shall have a minimum gain margin of 6 dB. The flux budget is the difference between the transmitter output power and the receiver input power required for signal discrimination when both are expressed in dBm. The flux budget shall be equal to the sum of losses (such as insertion losses, connector and splice losses, and transmission losses) plus the gain margin. When a repeater or other signal regenerating device is inserted to extend the length of an FO circuit, both the circuit between the transmitter and the repeater-receiver, and the circuit between the repeater-transmitter and the receiver are considered independent FO links for gain margin calculations.

2.12.3 Receiver Dynamic Range The dynamic range of receivers shall be large enough to accommodate both the worst-case, minimum receiver flux density and the maximum possible, receiver flux density. The

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receiver dynamic range shall be at least 15 dB. Where required, optical attenuators shall be used to force the FO link power to fall within the receiver dynamic range.

2.13 Optical Fibers:

2.13.1 General Optical fibers shall be coated with a suitable material to preserve the intrinsic strength of the glass. The outside diameter of the glass-cladded fiber shall be nominally 125 microns, and shall be concentric with the fiber core. Optical fibers shall meet EIA ANSI/EIA/TIA-455-46A, EIA ANSI/EIA-455-65, and EIA ANSI/TIA/EIA-455-177A.

2.13.2 50 Micron Multimode Fibers The fibers shall be certified to meet EIA ANSI/EIA/TIA-455-30B and EIA ANSI/EIA/TIA-455-58A.

2.13.3 62.5 Micron Multimode Fibers FO cable shall be certified to meet EIA ANSI/EIA/TIA-455-30B and EIA ANSI/EIA/TIA-455-58A.

2.13.4 8.3 Micron Single Mode Fibers shall be certified to meet EIA ANSI/EIA/TIA-455-170.

2.14 Cross-Connects: Patch Panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection.

2.15 Cable Construction: Flooded cables shall comply with EIA ANSI/EIA-455-81A and EIA ANSI/EIA/TIA-455-82B. Cables shall be from the same manufacturer, of the same cable type, and of the same size. Each fiber and protective coverings shall be continuous with no factory splices. Fiber optic cable assemblies, including jacketing and fibers, shall be certified by the manufacturer to have a minimum life of 30 years. Plenum cable shall meet UL 910, and riser cable shall meet UL 1666. FO cable shall be certified to meet the following: EIA ANSI/TIA/EIA-455-13A, EIA ANSI/EIA/TIA-455-25B, EIA ANSI/TIA/EIA-455-41A, EIA ANSI/EIA/TIA-455-47B, EIA ANSI/EIA/TIA-455-59, EIA ANSI/EIA/TIA-455-61, EIA ANSI/EIA-455-88, EIA ANSI/EIA-455-91, EIA ANSI/TIA/EIA-455-104A, and EIA ANSI/EIA-455-171.

2.16 FO Connectors: shall be the straight tip, bayonet style, field installable, self-aligning and centering. FO connectors shall match the fiber core and cladding diameters. The connector coupler shall be stainless steel and the alignment ferrule shall be ceramic. FO equipment and cable shall use the same type connectors. Connector insertion loss shall be nominally 0.3 dB and less than 0.7 dB.

2.17 Mechanical Splices: Mechanical splices shall be suitable for installation in the field. External power sources shall not be required to complete a splice. Splices shall be self-aligning for optimum signal coupling. Mechanical splices shall not be used for exterior applications where they may be buried underground or laced to aerial messenger cables. Mechanical splices may be used for interior locations and within enclosures. Splice closures shall protect the spliced fibers from moisture and shall prevent physical damage. The splice closure shall provide strain relief for the cable and the fibers at the splice points.

PART 3 EXECUTION

3.1 INSTALLATION System components and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown. Interconnections, services, and adjustments required for a complete and operable data transmission system shall be provided.



3.1.1 Interior Work Cable installation and applications shall meet the requirements of NFPA 70 , Article 770, Sections 52 and 53. Cables not installed in conduits or wireways shall be properly secured and neat in appearance.

3.1.2 Aerial Cable Except as otherwise specified, poles and associated aerial hardware for an overhead FO cable system shall be installed as specified in Section 16370 Overhead Electrical Distribution Systems.

- a. A messenger cable system to support aerial cables shall be furnished. The messenger system shall be capable of withstanding a minimum of 4500 pounds of tension, including appurtenances, guys, and hardware. Messenger cables shall be galvanized zinc coated steel or aluminum clad steel.
- b. The messenger cables shall be grounded at dead ends, at the entrance to each facility, and at intervals not exceeding 1000 feet.
- c. Aerial FO cables shall meet the horizontal, vertical and climbing space clearances in IEEE C2.
- d. Splices in aerial cable shall be within 3 feet of a pole and placed inside a watertight enclosure. Drip loops shall be formed at the cable entrance to the enclosure. Lashing clamps shall be placed within 12 inches of the enclosure.
- e. Loops shall be formed in the aerial cables at points of connection and at poles to prevent damage from thermal stress and wind loading. The communications cable shall be protected from chafing and physical damage with the use of spiral cut tubing and PVC tape, or plastic sleeves. The ground clearance of installed cabling shall be as shown.
- f. Cable shall be run vertically and when possible shall use gravity to assist in cable pulling. Cable shall be pulled from top of run to bottom of run. Cable shall be hand pull if possible. If machine assistance is required, tension shall be monitored using dynamometers or load-cell instruments and shall not exceed specified cable tension limits. After installation, the vertical tension on the cable shall be relieved at maximum intervals of 100 feet using a split support grip.
- g. Lashing wire shall be wound tightly around both the communication cable and the messenger cable by machine methods. The lashing wire shall have a minimum of 1 turn per 14 linear inches and not less than the number of turns per unit length that is recommended by the cable manufacturer for the distance between cable support points and the combined ice and wind loading and extreme wind loading shown or normally encountered loading for the installed location. Lashing clamps shall be placed at all poles and splices

3.1.3 Exterior Underground Cable Except as otherwise specified, conduits, ducts, and manholes for underground FO cable systems shall be installed as specified in Section 16375 Underground Electrical Distribution Systems and as shown.

- a. Minimum burial depth for cable shall be 30 inches, but not less than the depth of the frost line. Burial depth specified shall take precedence over any requirements specified elsewhere.
- b. Where direct burial cable will pass under sidewalks, roads, or other paved areas and no existing conduits or duct banks are available, the cable shall be placed in a 1 inch rigid coated galvanized steel conduit or larger as required to limit conduit fill to 80 percent or less.
- c. Buried cables shall be placed below a plastic warning tape buried in the same trench or slot. The tape shall be 12 inches above the cable. The warning tape shall be continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW" at not more than 48 inch intervals. The plastic tape shall be acid and alkali resistant polyethylene film, 3 inches wide with a minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 pounds per square inch lengthwise and 1500 pounds per square inch crosswise.

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d. During pulling the cable pull line tension shall be continuously monitored using dynamometers or load-cell instruments, and shall not exceed the maximum tension specified by the cable manufacturer. The mechanical stress placed upon the cable during installation shall be such that the cable is not twisted or stretched.

3.1.4 Service Loops Each fiber optic cable shall have service loops of not less than 10 feet in length at each end. The service loops shall be housed in a service loop enclosure.

3.1.5 Metallic Sheath Grounding Fiber optic cable with metallic sheath routed in the trench with a power cable shall have the metallic sheath grounded at the cable termination points.

3.1.6 Splices No splices will be permitted unless the length of cable being installed exceeds the maximum standard cable length available from a manufacturer or unless fiber optic pigtails are used to connect transmitters, receivers, or other system components for terminations to the fiber. Splices shall be made using the method recommended by the cable manufacturer. Splices shall be housed in a splice enclosure and shall be encapsulated with an epoxy, ultraviolet light cured splice encapsulant or otherwise protected against infiltration of moisture or contaminants. FO splices shall be field tested at the time of splicing. Fusion splices shall have less than 0.2 dB loss. Mechanical splices shall have less than 0.5 dB loss. There shall be no more than 1 splice per 0.6 mile in any of the FO cables excluding terminations. Field splices shall be located in cable boxes. Sufficient cable shall be provided in each splicing location to properly rack and splice the cables, and to provide extra cable for additional splices. Cable ends shall be protected with end caps except during actual splicing. During the splicing operations, means shall be provided to protect the unspliced portions of the cable and its fibers from the intrusion of moisture and other foreign matter.

3.1.7 Connectors shall be as specified in paragraph FO CONNECTORS. Fibers at each end of the cable shall have jumpers or pigtails installed of not less than 3 feet in length. Fibers at both ends of the cable shall have connectors installed on the jumpers. The mated pair loss, without rotational optimization, shall not exceed 1.5 dB. The pull strength between the connector and the attached fiber shall not be less than 50 pounds.

3.1.8 Identification and Labeling Identification tags or labels shall be provided for each cable. Markers, tags and labels shall use indelible ink or etching which will not fade in sunlight, or in buried or underground applications. Markers, tags, and labels shall not become brittle or deteriorate for a period of 20 years. Label all termination blocks and panels with cable number or pair identifier for cables in accordance with EIA ANSI/TIA/EIA-606 and as specified. The labeling format shall be identified and a complete record shall be provided to the Government with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

3.1.9 Enclosure Sizing and Cable Termination enclosures shall be sized to accommodate the FO equipment to be installed. Sizing shall include sufficient space for service loops to be provided and to accommodate a neat, workmanlike layout of equipment and the bend radii of fibers and cables terminated inside the enclosure.

3.1.10 Enclosure Penetrations Enclosure penetrations shall be from the bottom and shall be sealed with rubber silicone sealant to preclude the entry of water. Conduits rising from underground shall be internally sealed.

3.2 Testing:

3.2.1 General The Contractor shall provide personnel, equipment, instrumentation, and supplies necessary to perform testing.



3.2.2 Contractor's Field Test The Contractor shall verify the complete operation and performance of the data transmission system in conjunction with field testing associated with systems supported by the fiber optic data transmission system prior to formal acceptance testing. Field tests shall include a flux density test. These tests shall be performed on each link and repeated from the opposite end of each link.

3.2.2.1 Optical Time Domain Reflectometer Tests Optical time domain reflectometer tests shall be performed using the FO test procedures of EIA ANSI/EIA/TIA-455-59. An optical time domain reflectometer test shall be performed on all fibers of the FO cable on the reel prior to installation. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. Photographs of the traces shall be furnished to the Government. An optical time domain reflectometer test shall be performed on all fibers of the FO cable after it is installed. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. If the optical time domain reflectometer test results show anomalies greater than 1 dB, the FO cable segment is unacceptable to the Government. The unsatisfactory segments of cable shall be replaced with a new segment of cable. The new segment of cable shall then be tested to demonstrate acceptability. Photographs of the traces shall be furnished to the Government for each link.

3.2.2.2 Power Attenuation Test Power attenuation test shall be performed at the light wavelength of the transmitter to be used on the circuit being tested. The flux shall be measured at the FO receiver end and shall be compared to the flux injected at the transmitter end. There shall be a jumper added at each end of the circuit under test so that end connector loss shall be validated. Rotational optimization of the connectors will not be permitted. If the circuit loss exceeds the calculated circuit loss by more than 2 dB, the circuit is unsatisfactory and shall be examined to determine the problem. The Government shall be notified of the problem and what procedures the Contractor proposes to eliminate the problem. The Contractor shall prepare and submit a report documenting the results of the test.

3.2.2.3 Gain Margin Test The Contractor shall test and verify that each circuit has a gain margin which exceeds the circuit loss by at least 6 dB.

3.2.2.4 Analog Video Test Analog circuits shall be tested using a signal conforming to EIA 170 . The monitor or automated test set shall be stable, and shall be as described in EIA 170 . If the result is unsatisfactory, the circuit shall be examined to determine the problem. The Government shall be notified of the problem and of the procedures the Contractor proposes to eliminate the problem. The Contractor shall prepare and submit a report documenting the results of the test.

3.3 TRAINING :

3.3.1 General The Contractor shall conduct a training course for designated personnel in the maintenance of the FO system. The training shall be oriented to the specific system being installed under this specification. The Contractor shall furnish training materials and supplies.

3.3.2 Maintenance Personnel Training The system maintenance course shall be taught at the project site after completion of the endurance test for a period of 1 training day. A maximum of five personnel designated by the Government will attend the course. The course shall be videotaped by contractor and tape given to contracting officer. Training shall include:

- a. Physical layout of the system and each piece of hardware.
- b. Troubleshooting and diagnostics procedures.
- c. Repair instructions.
- d. Preventative maintenance procedures and schedules.
- e. Calibration procedures. Upon completion of this course, the students shall be fully proficient in the maintenance of the system.

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SECTION 16115 UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of underground electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Conductors: Cables shall be single conductor type unless otherwise indicated.

2.1.1 Medium-Voltage Cables Conductor Material Underground cables shall be soft drawn copper complying with ASTM B 3 and ASTM B 8 for regular concentric and compressed stranding or ASTM B 496 for compact stranding. When selected conductor shall be aluminum alloy 1350, 3/4 hard minimum complying with ASTM B 609, ASTM B 609M and ASTM B 231 for regular concentric and compressed stranding or ASTM B 400 for compacted stranding.

2.1.2 Insulation Cable insulation shall be cross-linked thermosetting polyethylene (XLP) insulation conforming to the requirements of NEMA WC 7 and AEIC CS5 or when specified ethylene-propylene-rubber (EPR) insulation conforming to the requirements of NEMA WC 8 and AEIC CS6. A 133 percent insulation level shall be used on 5 kV, 15 kV and 25 kV rated cables.

2.1.3 Shielding When specified cables rated for 2 kV and above shall have a semiconducting conductor shield, a semiconducting insulation shield, and an overall copper shield for each phase.

2.1.4 Neutrals Neutral conductors shall be copper or aluminum, employing the same conductor, insulation and jacket materials as phase conductors, except that a 600-volt insulation rating is acceptable.

2.1.5 Jackets Cables shall be provided with a PVC, polyethylene, or other specified jacket. Direct buried cables shall be rated for direct burial.

2.1.6 Low-Voltage Cables Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70, and be UL listed for the application or meet the applicable section of either ICEA or NEMA standards.

2.1.7 Conductor Material Underground cables shall be annealed copper complying with ASTM B 3 and ASTM B 8. When specified cables may be Type AA-8000 aluminum conductors complying with ASTM B 800 and ASTM B 801. Intermixing of copper and aluminum conductors is not permitted.

2.1.8 Insulation must be in accordance with NFPA 70, and must be UL listed for the application or meet the applicable sections of either ICEA, or NEMA standards.

2.1.9 Jackets Multiconductor cables shall have an overall PVC outer jacket.

2.1.10 Direct Buried Single and multi-conductor cables shall be of a type identified for direct burial. Service entrance cables shall conform to UL 854 for Type USE service entrance cable.

2.1.11 In Duct Cables shall be single-conductor cable, in accordance with NFPA 70. Cables in factory-installed, coilable-plastic-duct assemblies shall conform to NEMA TC 5 or NEMA TC 7.

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2.1.12 Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.2 Conduits and Ducts: Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application. When specified duct lines shall be concrete-encased, thin-wall type. When specified duct lines shall be nonencased direct-burial, thick-wall type. Where concrete encasement is not required, low-voltage circuits may utilize factory-installed cable in coilable plastic duct.

2.2.1 Metallic Conduit Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

2.2.2 Nonmetallic Ducts

2.2.2.1 Bituminized Fiber Duct UL 1684 for Type I (Thinwall) or Type II (Thickwall).

2.2.2.2 Concrete Encased Ducts UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.2.2.3 Direct Burial UL 651 Schedule 40 and Schedule 80 as indicated, or NEMA TC 6 Type DB.

2.2.3 The Conduit Sealing Compound for sealing ducts and conduits shall have a putty-like consistency hand workable at temperatures as low as 35 degrees F. Compound shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compound shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compound shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen, materials, or upon the environment.

2.2.4 Manholes, Handholes, and Pullboxes Manholes, handholes, and pullboxes shall be as selected. Strength of manholes, handholes, and pullboxes and their frames and covers shall conform to the requirements of IEEE C2. Precast-concrete manholes shall have the required strength established by ASTM C 478, ASTM C 478M. Frames and covers shall be made of gray cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. Cast iron shall comply with ASTM A 48, Class 30B, minimum. Handholes for low voltage cables installed in parking lots, sidewalks, and turf areas shall be prefabricated from a cement mixture consisting of sand and aggregate with continuous woven glass strands. Mixture shall have an overall compressive strength of at least 10,000psi and a flexural strength of at least 5,000 psi. Pullbox and handhole covers in sidewalks, and turf areas shall be of the same material as the box. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

2.3 Tape: Fireproofing tape shall be at least 2 inches wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables. Preapplication plastic tape shall be pressure sensitive, 10 mil thick, conforming to UL 510.



2.4 Insulators: ANSI C29 8 and C29 9.

2.5 General Electrical: ANSI C2, NFPA 70.

2.6 Testing: IEEE 48.

2.7 Concrete: Aggregate, ASTM C 33; Portland cement, ASTM C 150, Type 1; compressive strength 4,000 psi at 28 days.

3.0 EXECUTION:

3.1 Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.

3.2 Tests: All underground lines, splices, and terminations that have undergone maintenance, repair, or are new installation shall be tested before placement in service.

3.3 Ductbank: No dips or low points that retain water are permissible. Conduit shall be encased with not less than 3 inches of concrete when not direct-buried.

3.4 Manholes and Handholes shall be spaced and installed so as not to exceed the pulling tensions of the cables to be pulled. Maximum pulling tensions shall be as recommended by the cable manufacturer.

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SECTION 16121 INSTITUTIONAL ELECTRIC HEATING EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of institutional electric heating equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Controls: NEMA DC 4, UL 20, UL 917, and UL 1020.

2.2 Heaters: UL 499.

2.3 General Electrical: NFPA 70 and 70B.

2.4 Asbestos Usage: Materials containing asbestos shall not be used.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that heating equipment has been de-energized. Temporary heaters shall be supplied if required to maintain temperature.

3.2 Motor Repair: Electric motors to be repaired shall be done by a shop specializing in the repair of motors.



SECTION 16123 ELECTRICAL DISTRIBUTION SYSTEM GROUNDING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system grounding. Products shall match existing materials and/or shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: (Section not used.)

3.0 EXECUTION:

3.1 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.

3.2 Outages: Service interruptions shall be limited in number and duration, and the extent of lines involved shall be held to a minimum.

3.3 Protection: Take precautions, in compliance with ANSI C2, to prevent injury to personnel and to avoid damage to equipment and other property.

3.4 Workmanship: Installation shall be in compliance with IEEE 80 and 142. Install protective moulding, staples and conduit as recommended by these standards.

3.5 Trenching: Exercise care when digging trenches for installation or testing of ground equipment. Protect adjacent structures and properly shore excavations.

3.6 Grounding shall comply with NFPA 70, ANSI C2, and IEEE 80 and 142. Ground neutral conductors, cable shields, metallic cable sheaths and armor, metallic conduits, pothead bodies, junction boxes, lightning arresters, fence enclosures, and noncurrent-carrying metallic parts of equipment. Ground rods shall be made of copper, or copper-clad steel not less than 1-inch by 8 feet long and, except those installed in manholes, shall be driven into the earth at least 9 feet. Ground connections in earth shall not be backfilled until after inspection by the Contracting Officer. Repairs and maintenance of the grounding system shall include resistance measurements and tightening of all bolted connections.

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SECTION 16233 CLOCK AND PROGRAM SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of clock and program systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Time and Control: UL 863 and 916.

2.2 General Electrical: NFPA 70 and 70B.

3.0 EXECUTION: Contractor shall determine that required notices have been given and that power to the equipment has been disconnected.



SECTION 16300 MOTOR CONTROL CENTERS, PANELBOARDS AND LOAD CENTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of panelboards and load centers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Panelboards: Fed. Spec. W-P-115, NEMA PB 1, and PB 1.1. Panelboards shall be UL 67 labeled. Enclosures shall meet the requirements of UL 50. Outdoor cabinets shall be NEMA 3R raintight.

2.2 Fuses and Fuse Holders: ANSI/UL 512, 198. See Section 16440 for additional requirements.

2.3 Molded Case Circuit Breakers: NEMA AB1. See Section 16440 for additional requirements.

2.4 General Electrical: NFPA 70 and 70B.

2.5 Enclosures Beyond Repair: Replace with the same size and type in compliance with NEMA ICS and Fed. Spec. W-P-115. Carbon steel, ASTM A 366; stainless steel, ASTM A 176; galvanized sheet steel, ASTM A 526.

2.6 Motor Control Centers: Each motor control center shall be designed for operation on the selected voltage, phase and frequency requirements. The equipment shall conform to all the applicable requirements of NEMA ICS 1, NEMA ICS 2, NEMA ICS 4 and NEMA ICS 6. Vertical sections and individual units shall be listed and labeled under UL 845 where ever possible. In lieu of the UL listing, certification from any nationally recognized, adequately equipped, testing agency that the individual units and vertical sections have been tested and conform to the UL requirements of that agency will be acceptable when approved by the Contracting Officer. The motor control center shall be NEMA Class II, Type B or C as specified motor control centers in accordance with NEMA ICS 2.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that equipment served by panelboards and load centers will not be damaged before or after power is cut off and that power to the panelboards and load centers has been disconnected or cut off.

3.2 Clearances: Working clearances required by NFPA 70 shall be provided.

3.3 Tests: All devices and systems that have undergone maintenance, repair, or are new installation shall be tested before placement in service.

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SECTION 16313 ELECTRIC MOTORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of electric motors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Parts shall be factory-made. Existing bolts and screws that are rusted, corroded, cross-threaded, or otherwise defective and are removed due to repair work shall be replaced with new bolts and screws.

2.2 Motor Assemblies and Components for replacement purposes shall be designed for same service as existing. Repaired rotors shall be balanced. Brushes worn to within 20 percent of usable length shall be replaced with same type and size brushes.

2.3 New Motor shall be of like kind and of the same size, performance rating, and characteristics as the existing motor to be replaced and shall comply with NEMA MG 1 and UL 1004.

2.4 Products included in these specifications are:

2.4.1 Single Phase Induction Motor.

2.4.2 Universal Motor.

2.4.3 Polyphase Squirrel-Cage Induction Motor.

2.4.4 Polyphase Wound Rotor Induction Motor.

2.4.5 Polyphase Synchronous Motor.

2.4.6 Direct Current Motor.

2.5 Technical Specifications: Six copies of complete descriptive specification of each type and size motor provided, with necessary cuts, photographs, and drawings to clearly indicate the construction of the motor, the materials and treatments used to prevent corrosion of parts, bearing construction, and type of insulation used on all windings. Submittal shall include all information required for selection of protective and control equipment and for operational setting, such as, but not limited to, normal and maximum operation temperature for windings and bearings, overload trip setting for motor maximum condition and starting times for starting at rated and 90 percent starter voltage. Contracting Officer's approval shall be obtained in writing prior to the commencement of manufacture/procurement of motors.

3.0 EXECUTION:

3.1 Compliance: Take precautions in accordance with the National Electrical Safety Code. Workmanship shall be executed in compliance with NFPA 70 and 70B.



3.2 Scheduling and Coordination: Contractor shall determine that required notices have been given and that equipment served by the motor will not be damaged due to motor shutdown.

3.3 Lubrication, Operation, and Adjustment: Before operational testing, thoroughly clean electric motor of all foreign material, and lubricate all electric motors or parts requiring lubrication with the types of lubricants recommended by the electric motor manufacturer.

3.4 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that are not indicated or specified to be corrected under the contract, they shall be promptly reported to the Contracting Officer. The Contractor may submit recommendations for correction of such deficiency, safety hazard, or code violation with his report.

3.5 Requirements Specific To Each Motor Type:

3.5.1 Single-Phase Induction Motors:

3.5.1.1 Single-Phase Induction Motors shall comply with NEMA MG 1.

3.5.1.2 Frame Sizes shall comply with NEMA MG 13.

3.5.2 Universal Motors:

3.5.2.1 Armature: Core of armatures shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.

3.5.2.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1 paragraphs 20.53, 21.54, and 12.06.

3.5.2.3 Bearings shall be sleeve bearing or ball bearing type complying with NEMA MG 1.

3.5.2.4 Brushholders shall be in compliance with NEMA MG 1.

3.5.2.5 Brushes shall be in compliance with NEMA CB 1.

3.5.2.6 Shaft shall be in compliance with NEMA MG 1.

3.5.3 Polyphase Squirrel-Cage Induction Motors:

3.5.3.1 Polyphase Squirrel-Cage Induction Motors shall comply with NEMA MG 1.

3.5.3.2 Frame Size shall comply with NEMA MG 13.

3.5.4 Polyphase Wound Rotor Induction Motors:

3.5.4.1 Polyphase Wound Rotor Induction Motor shall comply with NEMA MG 1.

3.5.4.2 Frame Size shall comply with NEMA MG 13.

3.5.4.3 Brushes shall be in compliance with NEMA CB 1.

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3.5.4.4 Stator shall be rewound with conductors of same gauge and material as the existing stator.

3.5.4.5 Rotor shall be rewound with conductors of same gauge and material as the existing rotor.

3.5.5 Polyphase Synchronous Motors:

3.5.5.1 Polyphase Synchronous Motor shall comply with NEMA MG 1.

3.5.5.2 Frame Size shall comply with NEMA MG 13.

3.5.5.3 Brushes shall comply with NEMA CB 1.

3.5.6 Direct Current Motors:

3.5.6.1 Armature core shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.

3.5.6.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1 paragraphs 20.53, 21.54, and 12.06.

3.5.6.3 Bearings shall be ball bearing or sleeve bearing type in compliance with NEMA MG 1.

3.5.6.4 Brushholders shall be in compliance with NEMA MG 1.

3.5.6.5 Frame size shall comply with NEMA MG 13.

3.5.6.6 Shaft shall be in compliance with NEMA MG 1.

3.5.6.7 Brushes shall be in compliance with NEMA CB 1.

3.6 Outages and Testing of Electric Motors:

3.6.1 Outages and service interruptions shall be held to a minimum. De-energization will be accomplished by station forces.

3.6.2 Preinstallation Test: Existing motors that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in NFPA 70B. Furnish the results of the tests to the Contracting Officer.



SECTION 16415 ELECTRICAL DISTRIBUTION SYSTEM VOLTAGE REGULATORS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system voltage regulators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Material: Voltage regulators shall comply with IEEE ANSI/IEEE C57.15 and shall be of the outdoor, self-cooled, 55/65 degrees C temperature rise, single-phase or three-phase station-type. Two single-phase units connected in open-delta are not acceptable. Windings and the load-tap-changing mechanism shall be mineral-oil-immersed. When operating under load, a regulator shall provide plus and minus 10 percent automatic voltage regulation in approximately 5/8 percent steps, with 16 steps above and 16 steps below rated voltage. Automatic control equipment shall provide Class 1 accuracy. Bypass surge arresters shall be suitable for a grounded or alternately as specified an ungrounded system and for the associated regulator voltage. Station or Intermediate class surge arresters shall be mounted next to each incoming line bushing on a regulator tank-mounted bracket and connected to a surge arrester ground pad-mounted on the regulator tank. New mineral oil shall comply with ASTM D 923.

3.0 EXECUTION:

3.1 Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Maintenance and Repair Work: All maintenance and repair work shall be accomplished and in compliance with applicable ANSI C57-series and ASTM standards.

3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

3.5 Test Reports on field tests made in compliance with ANSI C57.15 shall be submitted to the Contracting Officer.

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SECTION 16416 TRANSFORMERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for new and/or repair and maintenance of existing transformers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Transformer Assemblies and Components for replacement purposes shall be designed for the same service as existing. New transformers shall comply with IEEE ANSI/IEEE C57.12.00 for general requirements and ANSI C57.12.20 for specific requirements for overhead transformers.

2.2 Transformers covered under this specification are as follows:

2.2.1 Dry Type Transformers.

2.2.2 Instrument Transformers.

2.2.3 Control Transformers.

2.2.4 Grounding Transformers.

2.2.5 Liquid-Filled Transformers.

3.0 EXECUTION:

3.1 Safety: Take precautions in compliance with the National Electrical Safety Code (ANSI/IEEE C2); execute work in compliance with NFPA 70 and 70B.

3.2 Coordination: Coordinate the work schedule with the Contracting Officer.

3.3 Repairs: Repair and retighten burned or broken lugs, windings, loose bolts, nuts, and screws. Repair windings in accordance with NEMA ST 20.

3.4 Testing: Perform electrical insulation tests to verify the integrity of any repairs prior to re-energization of the transformers, unless written permission is obtained from the Contracting Officer stating otherwise.

3.5 Oil Handling and Disposal: Handle and dispose of oil and oil contaminated materials in compliance with the latest Environmental Protection Agency requirements.

3.6 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be promptly reported to the Contracting Officer. The Contractor may submit recommendations for correction of the deficiency, safety hazard, or code violation with his report.

3.7 Additional Execution Requirements Specific to Each Type of Transformer:



3.7.1 Dry Type Transformers:

3.7.1.1 General: Replacement transformers shall have a winding configuration identical to that of the existing transformer and shall comply with NEMA ST 20, ANSI C57.12.22, C57.12.10, C57.12.40 and C57.12.01. Transformer shall be labeled as complying with UL1562.

3.7.1.2 Noise Isolation Pads shall be checked for excessive wear and replaced if necessary.

3.7.1.3 Dust shall be cleaned from transformer winding and enclosure ventilation louvers.

3.7.2 Instrument Transformers:

3.7.2.1 Current Transformers shall be manufactured in compliance with NEMA EI 21.1 and EI 21.2 and shall have an accuracy Class of 0.6 at burden designation of B-0.1 and B-0.2 and an accuracy of 1.2 at B-0.5 as defined in ANSI C57.13 for instrument transformers. Instrument transformers shall meet requirements of IEEE/ANSI C12.11 and C57.13.

3.7.2.2 Potential Transformers shall have an accuracy of 0.3W, 0.3X, 0.3Y, 1.2Z as defined in ANSI C57.13 for instrument transformers.

3.7.2.3 Fuses: Potential transformers shall be protected on the high and low voltage side by fuses. Fuse holders are to be installed in an easily accessible position.

3.7.2.4 Repair: No attempt to repair current or potential transformers shall be made.

3.7.3 Control Transformers:

3.7.3.1 Core shall be in compliance with UL 506 and NEMA ST1.

3.7.3.2. Fuses: All ungrounded conductors of primary and secondary of potential transformers shall be protected by fuses.

3.7.3.3 Repair: No attempt to repair control transformers shall be made.

3.7.4 Grounding Transformers:

3.7.4.1 Replacement Zig-Zag Grounding Transformers shall be three-phase zig-zag autotransformers or six single-phase transformers connected zig-zag and shall comply with UL 506.

3.7.4.2 Replacement Wye-Delta Grounding Transformers shall be three-phase transformers or three single-phase transformers connected wye-delta and shall be in compliance with ANSI C57.12.00.

3.7.4.3 Core shall be in compliance with ANSI C57.12.00.

3.7.5 Liquid-Filled Transformers:

3.7.5.1 Replacement Oil-Filled Transformers shall have a winding configuration identical to the existing transformer and shall comply with ANSI/IEEE C57.12.00, C57.12.90. Transformer shall be installed in accordance with ANSI/IEEE C57.93.

3.7.5.2 Gaskets shall match existing type removed.

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3.7.5.3 Liquid Dielectrics

3.7.5.3.1 Oil Added to Transformers shall be the same type as existing or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with NEMA TR P8. Mineral oil shall not be added to high fire point oils such as askarel and silicone.

3.7.5.3.2 Liquid dielectrics for transformers shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Nonflammable fluids shall not be used. Tetrachloroethylene (perchloroethylene) and 1, 2, 4 Trichlorobenzene (TCB) fluid shall not be used. Liquid dielectrics in retrofitted equipment shall be certified by the manufacturer as having less than 50 parts-per-million (ppm) PCB content. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

3.7.5.4 Repair Leaks by cleaning the leak area and welding or by applying 1/4-inch thick steel plate patch and welding in place. After welding, check the repaired area for leaks, reweld if leaking, reclean, and touch up with paint. Welding shall comply with AWS D1.1.

3.7.5.5 Gaskets, Vacuum, and Liquid Level Gauges found to be defective shall be replaced.

3.7.5.6 Ground Resistance Test Readings shall be performed across phase-to-phase windings and phase-to-ground windings. Tabulate results, and submit them to the Contracting Officer.

3.7.5.7 Dielectric Test shall be performed on oil samples taken from top and bottom filter press connections. Record and submit results to the Contracting Officer.

3.7.5.8 Transformer Liquid Levels shall be checked for correct level and filled if low. Oil added to transformers shall be same type as existing oil or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with ANSI/IEEE C57.91 and C57.92. Mineral oil shall not be added to high fire point oils such as askarel and silicone.

3.7.5.9 Transformer Tap Connections and tap changer shall be tightened.

3.7.5.10 Pressure of Inert Gas in cylinders used to maintain positive pressure inside transformer tank shall be checked. Replace cylinder if pressure fails below transformer manufacturer's recommended level for gas cylinder pressure.

3.7.6 Outages and Testing of Transformers:

3.7.6.1 Service Interruptions shall be held to a minimum. De-energization will be accomplished by others.

3.7.6.2 Preinstallation Test: Existing transformers that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in NFPA 70B. The results of the tests shall be furnished to the Contracting Officer.

3.7.6.3 Oil Test: Transformers shall have insulating oil tested.

3.7.6.4 Insulation Test: Transformers shall have insulation tested.



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SECTION 16439 UNINTERRUPTIBLE POWER SYSTEM (UPS)

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of uninterruptible power systems. Products shall match existing materials or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The UPS system shall consist of UPS module, battery system, battery protective device, system cabinet, static bypass transfer switch, controls and monitoring. Input ac power shall be connected to the normal source ac input of the UPS module. The battery shall be connected to the dc input of the UPS module through the battery protective device. The ac output of the UPS system shall be connected to the critical loads.

2.0.1 UPS Module and Battery System UPS module shall contain required input isolation transformer, rectifier/charger unit, inverter unit and controls, battery protective device, and any other specified equipment/devices. Battery system shall contain the battery cells, racks, battery disconnect, battery monitor and cabinet.

2.0.2 Cabinet, Static Bypass Transfer Switch, Control and Monitoring The UPS system shall include the system cabinet, static bypass transfer switch, system protective devices, monitoring and controls, means of isolating the system from the critical load, and remote monitoring interfaces.

2.1 Batteries: NEMA PE 1 for safety requirements and IEEE 485 for sizing. Battery system shall contain the battery cells, racks, battery disconnect, battery monitor and cabinet with seismic zone conditions considered. A storage battery with sufficient ampere-hour rating to maintain UPS output at full capacity for the specified duration shall be provided for each UPS module. The battery shall be of heavy-duty, industrial design suitable for UPS service. The cells shall be provided with flame arrestor vents, intercell connectors and cables, cell-lifting straps, cell-numbering sets, and terminal grease. Intercell connectors shall be sized to maintain terminal voltage within voltage window limits when supplying full load under power failure conditions. Cell and connector hardware shall be stainless steel of a type capable of resisting corrosion from the electrolyte used.

2.2 Battery Charger: UL 1236.

2.3 Switchgear: NEMA SG 5. UPS shall be coordinated with switchgear as described in section 16470.

2.4 Emergency and Standby Power Systems: IEEE 446.

3.0 EXECUTION:

3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.



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3.3 Maintenance, Repair, or Replacement Work: The Contractor shall check the UPS in accordance with the manufacturer's instructions Mil, Std. MIL-STD-202 and IEEE 446. If instructed by the Contracting Officer, the Contractor shall check for electromagnetic compatibility in accordance with Mil. Std. MIL-STD-461 and MIL-STD-462. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

3.4 Testing and Training: Contractor shall comply with all manufacturers recommended Installation testing, load testing, full load burn in testing, battery discharge testing. Contractor shall provide training classes to persons designated by contracting officer. Training shall be video taped by contractor and tape shall be provided to contracting officer. A factory training videotape may be provided as part of the training materials.



SECTION 16440 INTERIOR LOW-VOLTAGE DISCONNECTING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of interior low-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Enclosed Switch Box: Incoming line power fuse disconnecting units, consisting of power fuses and fuse disconnecting switches, shall comply with UL98 and NEMA SG 2. Expulsion-type or Current-limiting power disconnecting units and fuses shall have ratings in accordance with ANSI C37.46.

2.2 Fuse Holders and Fuses: NEMA FU 1, ANSI/UL 512, 198.2, 198B, and ANSI C97.1 as applicable. Equipment provided under this contract shall be provided with a complete set of properly rated fuses when;

- a. The equipment manufacturer utilizes fuses in the design of the equipment.
- b. If current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed fuses.

Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

2.3 Molded Case Circuit Breakers: Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489 and UL 877 for circuit breakers and circuit breaker enclosures located in hazardous (classified) locations. Circuit breakers may be installed in panelboards, switchboards, enclosures, motor control centers, or combination motor controllers. The circuit breakers shall be manually-operated, shall be quick-make, quick-break, common trip type, and shall be of automatic-trip type unless otherwise specified or indicated on the drawings. All poles of each breaker shall be operated simultaneously by means of a common handle. The operating handles shall clearly indicate whether the breakers are in "On," "Off," or "Tripped" position and shall have provisions for padlocking in the "Off" position. Personnel safety line terminal shields shall be provided for each breaker. The circuit breakers shall be products of only one manufacturer, and shall be interchangeable when of the same frame size. Where specified, circuit breakers shall be provided with shunt trip devices. Where specified, circuit breakers shall be provided with bell alarm contacts that close on automatic operation only.

2.4 General Electrical: NFPA 70 and 70B.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that the disconnecting device has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the disconnecting device will not be damaged by the power outage.

3.2 Clearances: Work clearances required by NFPA 70 shall be provided.



SECTION 16511 AUTOMATIC TRANSFER AND BY-PASS/ISOLATION SWITCHES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for automatic transfer and by-pass/isolation switches. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 AUTOMATIC TRANSFER SWITCH (ATS)

2.1.1 ATS shall be the electrically-operated type that is mechanically held in both operating positions. ATS shall be suitable for use in emergency systems or standby systems described in NFPA 70. ATS shall be UL listed unless the Contractor retains a nationally recognized independent testing laboratory to conduct tests, and test reports are approved as being equivalent of test results and certified test reports as those determined and reported by UL.

2.1.2 ATS shall also conform to NFPA 110 except that the ATS shall not be equipped with either overload or fault current protective devices. ATS shall be designed and manufactured to prevent stops in an intermediate or neutral position during transfer by the use of electrical actuators and stored-energy mechanisms. ATS designed and manufactured to effect transfers by a walking-beam or a similar device to engage handles of circuit breakers to accomplish transfer between power sources are unacceptable. Each pole of the doublethrow ATS shall have separate [arcing] contacts of a nonwelding type with switch contacts installed to permit viewing of the contacts without disassembly of the ATS or removal of the entire contact enclosure, or component parts of the ATS. ATS shall be rated for continuous duty at the continuous current rating specified. All rating data shall be shown on detail drawings, and shall equal or exceed those specified. The switches shall be fully compatible and approved for use with the BP/IS specified. Switches shall be adequately rated for the application indicated.

2.1.3 **Override Time Delay** Time delay to override monitored source deviation shall be adjustable from 0.5 to 6 seconds and factory set at 1 second. The device shall detect and respond to a sustained voltage drop of 30 percent of nominal voltage between any two of the normal or preferred supply conductors and initiate transfer action to the alternate/emergency source or start the engine-driven generator set after the set time period.

2.1.4 **Transfer Time Delay** Time delay before transfer to the alternate or emergency power source shall be adjustable from 0 to 5 minutes and factory set at 0 minutes. The device shall monitor the frequency and voltage of the alternate or emergency power source and transfer when frequency and voltage is stabilized at or above 90 percent of rated values. The pickup voltage shall be adjustable from 85 to 100 percent of nominal, and factory set at 90 percent. The pickup frequency shall be adjustable from 90 to 100 percent of nominal and factory set at 90 percent.

2.1.5 **Return Time Delay** Time delay before return transfer to the [normal] [preferred] power source shall be adjustable from 0 to 30 minutes and factory set at 30 minutes. The time delay shall be automatically defeated upon loss or sustained undervoltage of the alternate or emergency power source, provided that the supply has been restored.

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2.1.6 Auxiliary Contacts Two normally open and two normally closed auxiliary switches shall operate when the transfer switch is connected to the normal or preferred power source, and two normally open and two normally closed switches shall operate when the transfer switch is connected to the alternate or emergency power source.

2.1.7 Supplemental Features The ATS shall also be furnished with the following:

- a. Engine start contact.
- b. Alternate source monitor.
- c. Test switch.
- d. Close differential protection.
- e. Time delay by-pass switch.
- f. Manual return-to-normal switch.
- g. Motor starter control.

Undervoltage and timing relays, including any auxiliary relays required, shall be installed in the ATS enclosure to provide an adequate number and type of properly rated contacts to control the operation of remote motor controllers or starters shown. Devices and wiring in and external to the ATS shall cause motors to be de-energized for an adjustable period of time before the operation of the ATS in either direction and, subsequently, to cause motors connected to the ATS load bus to be energized.

2.1.8 Operator A manual operator, conforming to the applicable provisions of UL 1008, shall be provided to permit manual operation of the ATS without opening the ATS enclosure, and incorporate features to prevent operation by other than authorized and qualified personnel. The ATS shall be designed for use of the manual operator under no load conditions in the usual instances, but with the capability of operation under load conditions when necessary.

2.1.9 Green Indicating Lights A green indicating light shall supervise the normal or preferred power source and shall have a nameplate engraved NORMAL or PREFERRED.

2.1.10 Red Indicating Lights A red indicating light shall supervise the alternate or emergency power source and shall have a nameplate engraved ALTERNATE or EMERGENCY.

2.2 BY-PASS/ISOLATION SWITCH (BP/IS)

2.2.1 Design Switch shall permit load by-pass to either the normal/preferred or the alternate/emergency source of power and complete isolation of the associated ATS; independent of the operating position of the ATS. BP/IS shall not have overload or fault current protective devices. The BP/IS and the associated ATS shall be the products of the same manufacturer and shall be completely interconnected and tested at the factory and at the project site, as specified. The BP/IS shall be manufactured, listed and tested in accordance with paragraph AUTOMATIC TRANSFER SWITCH (ATS) and shall have electrical ratings that exceed or equal comparable ratings specified for the ATS. Switch design and construction shall prevent stops in an intermediate or neutral position during operations, but shall permit load by-pass and transfer switch isolation in no more than two manual operations which can be performed by one person in 5 seconds or less. The transfer speed shall be independent of the operation speed of the switch handles. The BP/IS operation shall be accomplished without disconnecting switch load terminal conductors. The isolation handle positions shall be marked with engraved plates, or other approved means, to indicate the position or operating condition of the associated ATS, as follows:

- a. Closed: The closed position shall indicate that the ATS is closed in one of the two operating positions.



b. Test: The test position shall indicate that the functional operation of the transfer switch can be tested without service interruption. In the test position, and in the open position, the BP/IS shall be capable of functioning as a manual transfer switch to permit loads to be transferred to either power source.

c. Open: The open position shall indicate that the transfer switch is isolated from the load and both power sources, and can be removed from the enclosure if required for maintenance or repairs.

2.2.2 Switch Construction The BP/IS shall be constructed for convenient removal of parts from the front of the switch enclosure without requiring the removal of other parts or disconnection of external power conductors. Contacts of the BP/IS shall be as specified for the associated ATS, including provisions for inspection of contacts without disassembly of the BP/IS or removal of the entire contact enclosure. BP/IS shall be interconnected with suitably sized copper bus bars silver plated at each connection point, braced to withstand magnetic and thermal forces created at the withstand rating specified for the associated ATS. The BP/IS and the associated ATS shall be interconnected in the same manner.

2.3 Enclosure: ATS and BP/IS and accessories shall be in a wallmounted or free-standing, floor-mounted and ventilated NEMA ICS 6 , smooth sheet metal enclosure constructed in accordance with UL 1008 .

2.3.1 Construction Enclosure shall be constructed for convenient removal and replacement of contacts, coils, springs and control devices from the front without the disconnection of external power conductors or the removal or disassembly of major components. Enclosure housing an ATS and BP/IS shall be constructed to protect personnel from energized components of the BP/IS during maintenance of the ATS.

2.3.2 Finishing Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in paint section.

2.4 Testing:

2.4.1 Laboratory Testing Testing shall be completed on the ATS or BP/IS to be supplied under these specifications, or shall have been completed on a previous, randomly selected standard production ATS or BP/IS unit having the same model number and capacity as the ATS or BP/IS specified. Overload, endurance and temperature tests shall be conducted in that sequence and within the shortest practicable period of time on the same ATS or BP/IS without de-energization of that ATS or BP/IS under test. The test sequence for the ATS or BP/IS listed below shall be followed. No deviation will be granted that is less stringent. Approval will not be granted to deviate from the overload, endurance and temperature test sequence.

- a. General
- b. Normal Operation
- c. Overvoltage
- d. Undervoltage
- e. Overload
- f. Endurance
- g. Temperature rise
- h. Dielectric Voltage – Withstand
- i. Contact Opening
- j. Dielectric Voltage - Withstand (Repeated)
- k. Withstand
- l. Instrumentation and Calibration of High Capacity Circuits
- m. Closings
- n. Dielectric Voltage - Withstand (Repeated)
- o. Strength of Insulating Base and Support

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2.4.2 Factory Testing In addition to other factory tests, each completely assembled ATS and BP/IS unit shall be subjected to dielectric and operational tests.

2.4.2.1 Withstand Test in Excess of UL 1008 Requirements The ATS [and BP/IS] shall be tested and rated to withstand an available fault or short-circuit current of rated amperes, RMS symmetrical, at a power factor between 0.0 and approximately 0.20 for a duration of 10 cycles at a maximum rated voltage.

2.4.2.2 Dielectric Tests Tests shall be performed in accordance with NEMA ICS 1 . Wiring of each control panel shall be subjected to voltage surge tests as stipulated in IEEE ANSI/IEEE C37.90.1 . Impulse withstand rating tests shall be performed accordance with the requirements of NEMA ICS 1.

2.4.2.3 Operational Tests Tests shall be performed and shall demonstrate that the operational sequence of each ATS or BP/IS unit conforms to the requirements of the specifications with regard to operating transfer time, voltage, frequency, and timing intervals.

PART 3 EXECUTION

3.1 Installation: The ATS or BP/IS shall be installed as indicated and in accordance with approved manufacturer's instructions.

3.2 Operational Testing: Following completion of the installation of the ATS or BP/IS, the Contractor shall perform operational tests in accordance with the written instructions of the manufacturer after having made proper adjustments and settings to demonstrate that the ATS or BP/IS functions satisfactorily and as specified. The Contractor shall advise the Contracting Officer not less than 5 work days prior to the scheduled date or dates for operational testing, and shall provide certified field test reports to the Contracting Officer within 2 calendar weeks following successful completion of the operational tests. The test reports shall describe all adjustments and settings made and all operational tests performed.



SECTION 16513 MOTOR GENERATOR SETS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of motor generator sets. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Batteries: SAE J537 and UL 1236, and IEEE 484 and 485, as applicable.

2.2 Instrument Transformers: ANSI C12.11 and IEEE C57.13 for revenue metering.

2.3 Motor and Generator: Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class F unless otherwise specified. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent overspeeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type. A generator field discharge resistor shall be provided if required by the generator manufacturer.

2.3.1 Diesel Engines shall operate on No. 2-D diesel conforming to ASTM D 975. Engines shall be designed for stationary applications and shall be complete with ancillary equipment including cold weather equipment.. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall be naturally aspirated, scavenged, supercharged or turbocharged. The engine shall be two- or four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an overspeed sensor.

2.3.2 Fuel System The fuel system for each engine generator set shall conform to the requirements of NFPA 30 and NFPA 37 and contain the following elements.

2.4 Battery Charger: A current-limiting battery charger, conforming to UL 1236, shall be provided and shall automatically recharge the batteries within 24 hours.

2.5 Switchgear: NEMA SG 5. Switchgear ratings at 60 Hz shall be in accordance with ANSI C37.06. Solid-state, electromechanical, or microprocessor-based protective relays shall be as shown and shall be of a type specifically designed for use on power switchgear. Protective relays shall conform to IEEE ANSI/IEEE C37.90. Relays and auxiliaries shall suitable for operation with the instrument transformer ratios and connections provided.

2.6 Electrical Instruments: Analog electrical indicating instruments shall be true RMS indicating instruments, in accordance with ANSI C39.1. Electronic indicating instruments shall be true RMS indicating instruments, 100 percent solid state, state-of-the-art, microprocessor controlled to provide specified functions.

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3.0 EXECUTION:

3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Maintenance, Repair, or Replacement Work: The Contractor shall check the generator sets in accordance with the manufacturer's instructions and Mil. Std. MIL-STD-705, MIL-HDBK-705, IEEE-43, IEEE-115, and SSPC-PA-1. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.



SECTION 16600 LUMINAIRE BALLASTS AND TRANSFORMERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaire ballasts and transformers. Products shall match existing materials and/or shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Constant-Current Transformers shall be of the automatic, moving-coil types designed to maintain the secondary current within 1 percent of rating when operating under normal loading conditions. A protective relay that will automatically disconnect the transformer from the line on open series circuit shall be provided as an integral component of the transformer. Transformers shall be rated 10 kW, 2,400 volts, 60 hertz primary and 6.6 amperes secondary.

2.2 Fluorescent Ballasts:

2.2.1 Magnetic ballast, energy-saving, high power factor, Class P, automatic-resetting Type, approved for the application by the Certified Ballast Manufacturers: ANSI C82.1 and UL 935. Two-lamp ballasts shall be used for each pair of lamps within a fixture or within continuous mounted fixtures. Single-lamp ballasts shall be used for individually mounted single-lamp fixtures and where an odd single-lamp fixture occurs at the end of a continuous group.

2.2.2 Electronic ballasts shall consist of a rectifier, high frequency inverter, and power control and regulation circuitry. The ballasts shall be UL listed, Class P, with a Class A sound rating and shall contain no PCBs. Ballasts shall meet 47 CFR 18 for electromagnetic interference and shall not interfere with the operation of other electrical equipment. Design shall withstand line transients per IEEE C62.41, Category A. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture, using one, two, three or four lamp ballasts. A single ballast may be used to serve multiple fixtures if they are continuous mounted, factory manufactured for that installation with an integral wireway, and are identically controlled.

2.3 High-Intensity Discharge Ballasts shall be high-power factor, single lamp type. Ballasts shall be Type 2, weatherproof for outdoor use per ANSI C82.4 and UL 1029.

2.4 Lamp Ballasts: ANSI C82.1, C82.4, UL 935, and UL 1029 as applicable.

2.5 Series Isolation Transformers for airfield lighting systems shall be equal to the original transformers in accordance with Air Force Manual (AFM) 14, Part II, Visual Air Navigation Facilities.

2.6 Transformers, Regulators, and Reactors shall be in compliance with the requirements of NEMA/IEEE C57.

3.0 EXECUTION: Contractor shall comply with provisions of the National Electric Code.

3.1 Maintenance and Repair of Regulators shall include cleaning or replacement of dirty or burned contacts, replacement of worn or broken mechanical parts and electrical insulation, cleaning and tightening connections, replacement of leaking seals and gaskets, replacement of burnt oil, stopping of tank leaks,

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securing of loose or broken mounts, repair of shorted windings, and testing of regulator against varying loads and for shorts and high resistances.

3.2 Temporary Wiring Modifications shall be made in order that the lighting system shall remain in operating condition, except for the item being repaired or replaced, during normal lighting periods.

3.3 Outages: Service interruptions shall be scheduled in advance with the Contracting Officer.



SECTION 16610 LUMINAIRES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaires. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Lamps: ANSI C78 series, C79 series.

2.1.1 High-Pressure Sodium Lamps shall conform to ANSI C78.1350, ANSI C78.1351, ANSI C78.1352, ANSI C78.1355. High-pressure sodium lamps shall be clear.

2.1.2 Mercury Vapor Lamps shall conform to ANSI C78.40.

2.1.3 Metal-Halide Lamps shall be made by a manufacturer with not less than 5 years experience in making metal-halide lamps. Metal-halide lamps shall conform to ANSI C78.1375 or ANSI C78.1376.

2.1.4 Lamps, Incandescent lamps shall conform to UL 1571 and shall be rated for 120 volt operation unless otherwise specified.

2.1.5 Lamps, Fluorescent lamps shall conform with ANSI C78.1 and shall have standard cool-white color characteristics and shall not require starter switches. The lamps shall be of the rapid-start type.

2.2 Fixtures: UL 781, UL 844, UL 595, UL 1570, UL 1571, and UL 1572.

2.2.1 Incandescent Fixture NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1571. UL 844 shall apply to hazardous areas.

2.2.2 Fluorescent NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1570.

2.2.3 High-Intensity-Discharge NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1572.

2.3 Lamp Bases and Holders: UL 496, 542, and ANSI C81 series.

2.4 Ballasts: UL 935, UL 1029, ANSI C82.4 and ANSI C82 series. Also See Section 16502.

2.5 General Electrical: NFPA 70.

2.6 All Luminaires shall be designated "IES distribution type" as referred to in the IES Lighting Handbook.

2.6.1 Luminaires shall be adjusted to achieve lighting levels and patterns specific to the application as recommended by the manufacturer. Each luminaire shall bear the UL label.

2.6.2 Only the Luminaire Being repaired or Replaced shall be disconnected from its source of supply during the normal operating hours of the lighting system.

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2.6.3 Luminaire Heads or Housings shall be die-cast aluminum with slip-fitter mounting and provided with 1-1/4 inch through 2-inch slip-fitter fittings. Luminaire heads shall have standard dimensions for interchangeable standard optical assemblies. Heads shall be internally wired and rated at 600 volts.

2.6.4 Enclosed Luminaire shall consist of an Alzak-finished aluminum reflector and enclosing refractor mounted on a standard luminaire head.

2.6.5 Open Luminaires shall consist of an Alzak-finished aluminum reflector with shielding reflector on house side providing IES Type I distribution, mounted on a standard luminaire head.

2.7 Incandescent Luminaires:

2.7.1 Luminaires Shall Be Enclosed Type for filament lamps with IES Type I distribution and shall have a glass refractor providing IES Type I distribution.

2.7.2 Floodlights Shall Be Enclosed Type with adjustable support brackets. Enclosed floodlights shall be Class HD having a beam spread of 10 to 18 degrees. Open type floodlights shall have a beam spread of 70 to 100 degrees.

2.8 Fluorescent Luminaires shall be the enclosed type.

2.9 High Intensity Discharge Luminaires shall be enclosed type for HID lamps with IES Type I distribution. Enclosed luminaires shall have an enclosing glass refractor providing IES Type I distribution.

3.0 EXECUTION:

3.1 Protection: Take precaution in accordance with ANSI C2.

3.2 All Service Interruptions shall be scheduled in advance with the Contracting Officer.

3.3 Workmanship: NFPA 70 and 70B.



SECTION 16616 STREET AND AREA LIGHTING CONTROLS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for street and area lighting controls. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Photocontrols shall be of the light-sensitive photo conductor cell type with integral line resistor and relay circuit having a line voltage circuit contact and capacitor and an across-the-line protective lightning arrester. Plug-in locking type shall be in compliance with UL 773. Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

2.2 Replacement Relay for control of circuit shall match mounting, voltage, and wattage of existing relay.

2.3 Timer Control Switches Astronomic dial type arranged to turn "ON" at sunset, and turn "OFF" at a pre-determined time between 2030 hours 0230 hours or sunrise, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise shall be provided. A switch rated for similar voltage, having battery backed electronic clock to maintain accurate time for a minimum of 7 hours following a power failure shall be provided. A time switch with a manual on-off bypass switch shall be provided. Housing for the time switch shall be a surface mounted, NEMA 3R enclosure conforming to NEMA ICS 6.

3.0 EXECUTION:

3.1 Temporary Wiring Modifications shall be made in order that the lighting system shall remain in operating condition during normal lighting periods, except for the control unit being repaired or replaced.

3.2 Photocontrol, Timers, and Electronic Control Units shall be inspected for proper operation and repaired or replaced as required.

3.3 Safety: Contractor shall comply with applicable provisions of the National Electric Code.



SECTION 16660 CENTRAL MONITORING, CONTROL, AND INSTRUMENTATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of central monitoring, control, and instrumentation equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Drawings and Data: Drawings and data on existing monitoring control and instrumentation equipment should be requested from the Contracting Officer.

2.2 Sensing Elements or Transducers: Devices that sense the condition, state, or value of a process variable and produce an output that reflects that condition.

2.3 Measurement and Signal Conditioning: Devices that condition and transmit the signal generated by the sensing element and transducers.

2.4 Control Devices: Include any device that performs a definite function in control system, such as any switch (limit, pressure, temperature, on-off, etc), valves, solenoid, relays, and solid-state control elements.

2.5 Central Monitoring and Control Devices: Include any device that either monitors the signal generated by the transmitters or control devices (indicators, recorders, annunciators, etc.) or provides a final control action from the signal generated by the transmitter such as controllers, computers, etc.

2.6 Product Codes and Standards:

2.6.1 Safety Requirements for Electrical Measuring and Controlling: ANSI C39.5.

2.6.2 Industrial Control Equipment: ANSI/UL 508.

2.6.3 Electrical Analog Indicating Instruments: ANSI C39.1.

2.6.4 Instrument Transformers: ANSI C57.13.

2.6.5 Industrial Controls and Systems: NEMA ICS.

2.6.6 National Electrical Code: NFPA 70.

2.6.7 Electrical Equipment Maintenance: NFPA 70B.

2.6.8 Limit Controls: UL 353.

2.6.9 Test Code for Industrial Controls: IEEE 74.

2.6.10 Master Test Code for Resistance Measurement: IEEE 118.



2.6.11 Master Test Code for Electrical Measurement in Power Circuits: IEEE 120.

2.6.12 Dynamic Response Testing of Process Control Instrumentation: ISA S26.

2.7 Intrusion detection: Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place. System equipment shall conform to UL 294 and UL 1076.

2.7.1 System Components System components shall be designed for continuous operation. Electronic components shall be solid state type, mounted on printed circuit boards conforming to UL 796. Printed circuit board connectors shall be plug-in, quick-disconnect type. Power dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity. Control relays and similar switching devices shall be solid state type or sealed electro-mechanical.

3.0 EXECUTION:

3.1 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.

3.2 Power Supplies that may be a hazard during the performance of the work shall be locked out.

3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.

3.4 Report: A final report shall be prepared after the maintenance, repair, or replacement has been accomplished. A list of all equipment worked on, the service performed on each piece of equipment, and calibration data shall be included in the report. The report shall be typed and furnished to the Contracting Officer.



SECTION 16680 AIRFIELD AND HELIPORT LIGHTING AND VISUAL NAVIGATION AIDS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of airfield and heliport lighting and visual navigation aids. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Beacons:

2.1.1 Airfield Rotating Beacon The rotating beacon for fixed wing aircraft shall be FAA AC 150/5345-12, Type L-802A, Class 1. A duplex type beacon with alternating green and white beams shall be provided. Beacons used on military airfields shall have a double-peaked white beam. Cabinet shall be provided with a NEMA ICS 6 type 3R enclosure of zinc-coated steel.

2.1.2 Heliport Beacon The heliport rotating beacon, shall be FAA AC 150/5345-12, Type L-801H, Class 2. Except for military facilities, the white beam shall be a double-peaked white flash. The beacon shall flash the three color sequence 10 to 15 times per minutes. The colors white, green, and yellow for a heliport or white, green, and red for a medical facility. The effective intensity of the white flash shall be not less than 25,000 candelas for vertical angles between 2 and 8 degrees and not less than 12,500 candelas between 0 and 10 degrees.

2.1.3 Airfield Identification/Code Beacon Fixture shall be in accordance with FAA AC 150/5345-43, Type L-866 with green filters and code flashing device. The beacon flashes shall be visible through 360 degrees. The effective intensity of the green flash shall be not less than 2,000 candelas. The code shall flash 6 to 8 codes per minute.

2.2 Wind Direction Indicator: The wind direction indicator shall be an FAA AC 150/5345-27, Type L-806, low mass supporting structure or L-807, rigid supporting structure, Style I-lighted, Size 1 - 8 feet.

2.3 Obstruction Lighting and Marking: Obstructions on or near the airfield or heliport shall be marked and/or lighted. Obstruction marker lights shall emit aviation red flashing and/or steady burning light as required. The light fixtures, shall be multiple-socket assembly or series socket assembly FAA AC 150/5345-43, Type L-810 or Type L-864. For multiple flashing lights on a circuit, the lights shall flash in unison. Obstruction marker lights shall be single or double unit type as specified. The obstruction lights shall be energized from series or multiple circuits as shown on the contract drawings or other contract documents.

2.4 High-Intensity Approach Lighting Systems:

2.4.1 Elevated High-Intensity Fixtures Except Flashing Units The elevated approach light fixtures shall be FAA E-982 frangible mounted lights with PAR-56 200 W, 300 W, or 500 W lamps as specified, and with aviation red and/or with aviation green filters as indicated. Elevated bi-directional threshold lights shall be FAA AC 150/5345-46, Type L-862 with aviation green filters on the approach side and aviation red filters on the runway side. The side row barrettes shall emit aviation red lights.



2.4.2 Sequence Flashing Lights (SFL) System The SFL system shall be FAA E-2159 and/or FAA AC 150/5345-51, Type L-849, or FAA E-2628 lights provided as an integrated part of the approach system. The SFL fixture shall include the elevated fixtures, the individual power supplies. The SFL shall flash twice per second in sequence towards the runway threshold.

2.4.3 Semi-flush, High-Intensity Approach Lights The approach lights in the overrun area, inner section of threshold bar, and paved areas with traffic, shall be semi-flush, high-intensity, base-mounted lights as shown. These semi-flush approach high-intensity fixtures shall be FAA AC 150/5345-46, Type L-850D for bi-directional or Type L-850E for unidirectional lights with lamps and filters.

2.5 Medium Intensity Approach Lighting:

2.5.1 Elevated, Medium-Intensity, Steady-Burning Fixtures The medium-intensity, elevated, steady-burning approach lights, shall be FAA E-2325 PAR 38 lamp holders with PAR-38 spotlight lamps frangibly mounted as directed.

2.5.2 Sequence Flashing Lights (SFL) for Medium Intensity Lights These elevated SFL fixtures (RAIL) shall meet the requirements of FAA E-2159 or FAA AC 150/5345-51, Type L-849 with eight lights shall be as indicated on the contract drawings as an integrated part of the approach system. The SFL shall flash twice per second in sequence towards the runway threshold.

2.6 Runway Alignment Indicator Lights (RAIL): The RAIL fixtures shall meet the requirements of FAA E-2159 or FAA AC 150/5345-51, Type L-849 with eight lights and shall include the individual power supplies.

2.7 Omni-directional Approach Light System (ODALS): The ODALS fixtures shall meet the requirements of FAA AC 150/5345-51, Type L-859 Style F. The ODALS shall include the 7 fixtures, the individual power supplies. The ODALS shall flash twice per second in sequence towards the runway threshold.

2.8 Runway End Identifier Lights (REIL): The REIL fixtures shall meet the requirements of FAA AC 150/5345-51, Type L-849, Style A, B or E. The REIL shall include the master and slave fixture, the power supply, and frangible mounts. The REIL units shall flash in unison twice per second.

2.9 Runway Lighting System: Runway lights include runway edge lights, runway threshold lights, runway centerline lights, runway touchdown zone lights, runway distance and arresting gear markers, mounting structures, controls, and the associated equipment and interconnecting wiring to provide complete systems as indicated and specified herein. In-pavement light fixtures shall be able to withstand a minimum static single wheel load of 50,000 pounds.

2.9.1 Runway Edge Lights The runway edge light fixtures shall meet the requirements of FAA AC 150/5345-46, Type L-862(elevated high-intensity), Type L-861(elevated medium-intensity, airfield and heliport), Type L-850C(semi-flush, high-intensity), or Type L-852E(semi-flush medium-intensity) white lights.

2.9.2 Runway Threshold and End Lights The threshold lights shall use aviation green filter and the end lights shall use aviation red filters. These lights shall be combined in a single bi-directional fixture with the appropriate color filters if so indicated. The runway threshold/end light fixtures shall meet the requirements of FAA AC 150/5345-46, Type L-862(elevated high-intensity, bi-directional), Type L-861 SE(elevated, medium-intensity, bi-directional), Type L-861(elevated, medium-intensity, omni-directional), Type L-852E(semi-flush, medium-intensity, omni-directional), Type L-850D(semi-flush, high-intensity, bi-directional), Type L-850C(semi-flush, high-intensity, unidirectional), FAA E-982 - PAR-56 (elevated unidirectional outboard of runway edges), or airfield and heliport lights as indicated on the contract drawings.

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2.9.3 Runway Centerline Lights, Tailhook Operations The fixtures shall be similar to FAA AC 150/5345-46 , Type L-852, and identified as Class N (Navy). The fixtures are available from Crouse Hinds Company, Cooper Industries. The fixtures shall be unidirectional, narrow beam, Type V, VI, VII, or VIII, with shorting device for failed lamp, modified to resist damage from aircraft tailhooks. The stainless steel top assembly shall have a Rockwell hardness of C40 plus or minus 5. Height of fixture shall be 1/2 inch above pavement in lieu of 3/8 inch. Optical assembly shall be secured with 410 or 416 stainless steel bolts.

2.9.4 Standard Duty Centerline Lights The fixtures shall be FAA AC 150/5345-46 , Type L-850A, Class 1 for inseting directly into pavement or Class 2 for installation on mounting bases. Filters shall be provided as indicated and conforming to requirements of fixture specifications.

2.9.5 Runway Touchdown Zone Lights The fixtures shall be FAA AC 150/5345-46 , Type L-850B.

2.9.6 Runway Distance Markers Runway distance markers shall conform to FAA AC 150/5345-44 , Type L-858B, Size 4, Style 3 with white or yellow numerals on a black background. Markers shall be provided, to withstand a static wind load of 0.28 pound per square inch, and suitable for connection to the secondary of the isolation transformers specified. Internally illuminated markers shall be provided with illumination of the face not less than 50 percent of that at rated current when the series lighting circuit is operated at the lowest brightness step. Marker housing shall be fiber reinforced epoxy, with information faces of high-impact acrylic or ultraviolet stabilized polycarbonate. The power supply and lamps shall be as indicated.

2.9.7 Arresting Gear Markers The arresting gear markers shall be the same as Runway Distance Markers, except markers shall have a 3.25 foot translucent yellow circle in place of numerals as specified above.

2.10 Taxiway Lighting Systems: Taxiway lighting systems shall include edge lights, centerline lights, guidance signs, and hold position lights and signs. These systems shall also include the associated equipment, power supplies and mounting devices to provide complete systems as specified.

2.10.1 Taxiway Edge Lights Taxiway edge light shall emit aviation blue light provided by filters or globes for both airfields and heliports. The edge lights shall meet the requirements of FAA AC 150/5345-46 , Type L-861(elevated), Type L-852E(semi-flush) lights.

2.10.2 Taxiway Centerline Lights Taxiway centerline lights shall be semi-flush fixtures using filters to provide aviation green light. These centerline light fixtures shall meet the requirements of FAA AC 150/5345-46 , Type L-852A(on straight sections) and Type L-852B(on curved sections).

2.10.3 Taxiway Guidance Signs The taxiway guidance signs shall meet the requirements of FAA AC 150/5345-44 , Type L-858Y(for information) and Type L-858R(for mandatory signs). The size and information on the signs shall be as shown on contract drawings.

2.10.4 Hold Position Lights and Signs The hold positions shall be marked by painted lines, lights and/or signs as specified. The lights shall meet the requirements of FAA AC 150/5345-46 , Type L-852A, semi-flush, unidirectional, with aviation yellow filter toward the taxiway approach to the runway. In some confusing locations FAA AC 150/5345-46 , Type L-804, elevated flashing lights may be required. Hold position signs shall meet the requirements of FAA AC 150/5345-44 , Type L-858R, with the size and information as indicated on the contract drawings.

2.11 Hoverlane Lights: The hoverlane lights shall be alternating aviation green and aviation yellow lights along the centerline of the hoverlane path. The fixtures shall be FAA AC 150/5345-46 , Type L-861, for elevated lights with alternating yellow and green globes as required or indicated on the contract drawings.



These lights shall be frangibly mounted on stakes or light bases. For hoverlanes across paved areas, the fixtures shall be FAA AC 150/5345-46, Type L-852E mounted on FAA AC 150/5345-42, Type L858 light bases. The hoverlane lights shall be energized from a power source as indicated on the contract drawings. The isolation transformers for series circuits shall be FAA AC 150/5345-47, Type L-830-1.

2.12 Explosion-Proof Fixtures for Hazardous Locations: Fixtures to be installed in explosive hazardous locations shall meet the requirements of and be listed by UL Eleconst Dir or FM P7825a, FM P7825b as defined in NFPA 70 for the hazard and application.

2.13 Glide Slope Indicator: The glide slope indicator for airfields shall be the Precision Approach Slope Indicator (PAPI). For the heliports the glide slope indicator unit shall be the PAPI or the CHAPI.

2.13.1 PAPI The light units for the PAPI shall meet the requirements of FAA AC 150/5345-28, Type L-880 or FAA E-2756. The system consists of four light units.

2.13.2 CHAPI The light units for the CHAPI systems for heliport glide slope indicators, if required, shall consist of two units which meet the basic requirements of FAA AC 150/5345-28, Type L-880, except the on-glide-slope indication has been replaced by a two degree wide green lens.

2.14 Limit Lights: The fixtures for limit lights shall be FAA AC 150/5345-46, Type L-861 with red globes and 45-watt lamps. These lights shall be frangibly mounted on steel stakes or light bases if in paved areas.

3.0 EXECUTION:

3.1 General Airport lighting and Navigational aids shall be installed in accordance with the manufacturer's instructions and other contract requirements and shall include cleaning, lubrication, adjustment, alignment and other special instructions. Supports shall be provided as indicated.

3.1.1 Holes for Light Fixtures Holes shall be bored in existing pavement to the dimensions indicated with a diamond-edged bit to provide a smooth, straight cut. Bottom of hole shall be flat or slightly concave, except that an area at least 1 inch wide around the perimeter shall be flat. Surfaces deeper than the prescribed depth shall be filled with sealant to the level of the flat area and allowed to cure before further placement.

3.1.2 Immediately prior to installation of wire or light fixtures, saw kerfs and holes shall be flushed with a high velocity water jet or steam, and then cleaned and dried with a high velocity air jet to remove dirt, water, and foreign material.

3.1.3 Lighting Fixture Installation: Sides and bottom of each light base shall be sandblasted immediately prior to installation. Inside faces of bored hole and bottom and sides of light base shall be covered with a coating of sealant that will completely fill the void between concrete and base. A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixture shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. Outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set. Fixture lead wires shall be properly arranged with respect to their connecting position. The wireway entrance into the light recess shall be blocked to retain the sealant material during curing.

3.1.4 Fixture Grounding Each fixture or group of adjacent fixtures shall be grounded by a grounding circuit separate from the counterpoise system unless required otherwise or by driven ground rods if permitted. Fixtures, steel light bases or grounding bushings on steel conduits shall be connected to an

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independent ground rod by a No. 6 AWG bare stranded copper wire. Semi-flush fixtures for direct mounting in pavement need not be grounded. Copper wire shall be connected to ground rods by exothermic weld or brazing.

3.1.5 Obstruction Marker Lights Obstruction marker lights shall be installed on radio towers, elevated water tanks, smokestacks, buildings, and similar structures with 1 inch zinc-coated rigid steel conduit stems using standard tees and elbows, except that lowering devices, when required, shall be installed in accordance with equipment manufacturer's recommendations.



SECTION 16814 TELEPHONE SYSTEM, OUTSIDE PLANT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for new and/or repair and maintenance of telephone system, outside plant. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 Cable:

2.1.1 Copper Conductor Cable shall conform to the following: RUS REA PE-89 or ICEA ANSI/ICEA S-85-625.

2.1.2 Direct Buried Cable shall be manufactured per RUS REA PE-89 or RUS REA Bulletin 345-39.

2.1.3 Underground Cable shall be manufactured per RUS REA PE-39 or RUS REA PE-89.

2.1.4 Screened cable shall comply with RUS REA PE-39 or RUS REA PE-89.

2.1.5 Fiber Optic Cable Reeled fiber optic cable shall be specifically designed for outside use, be filled or loose buffer construction, and conform to RUS REA Bulletin 345-90.

2.2 Conductor Closures:

2.2.1 Copper Conductor Closures

2.2.1.1 Aerial Closure The aerial closure shall be free breathing and suitable for housing straight and butt splices. The closure shall be constructed with ultraviolet resistant PVC.

2.2.1.2 Buried Closure shall conform to RUS REA Bulletin 345-72.

2.2.2 Fiber Optic Closures

2.2.2.1 Fiber Optic Aerial The aerial closure shall be free breathing and suitable for housing a splice organizer of non-pressurized communications cables. The closure shall be constructed with ultraviolet resistant PVC.

2.2.2.2 Fiber Optic Buried or Underground The buried closure shall be suitable for enclosing a splice organizer in a container into which can be poured an encapsulating compound. The closure shall protect the splice and be suitable for use in the buried environment. The encapsulating compound shall be re-entenable and shall not alter the chemical stability of the closure.

2.3 Cable Splices and Organizers: The connectors used shall be listed in RUS REA Bulletin 1755I-100.

2.4 Cable Terminals:

2.4.1 Pedestal-Type Cable Terminals Pedestal-type cable terminals shall conform to RUS Bulletin 1755.910.

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2.4.2 **Cross-connect Cable Terminals** Cross-connect cable terminals shall be weatherproofed for outdoor use and suitable for pole, pad, or stake mounting. The terminal shall be equipped with mounting columns and distribution rings for jumper-wire routing. The terminal shall be of aluminum or steel construction and ribbed for strength.

2.5 **Manhole and Duct:** shall conform to RUS REA TE&CM 643-02.

2.6 **Equipment Racks:** Distribution frames, cabinets, and back-boards shall be provided as shown and designed to mount connector blocks, protector blocks, cross connects, and other hardware required to terminate and protect the outside telephone plant cable; to provide a demarcation point between inside and outside plant cable; and to allow inside and outside plant cable to be cross connected.

2.7 **Connector Blocks:** The connector blocks shall be 24 gauge stub type. The cable stubs shall be 100 pair and conform to RUS REA PE-87.

2.8 **Protector Modules:** The protector modules shall be of the two-element gas tube type. Protection modules shall be heavy duty, A>10 kA, B>400, C>65A, where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current per ANSI C62.61. The gas modules shall shunt high voltage to ground, fail short, be equipped with an external spark gap and heat coils, and shall comply with UL 497.

2.9 **Fiber-Optic Cable:** Fiber Optic Connectors All outside plant fiber strands shall be terminated in a SC or ST type fiber optic connector, with ceramic ferrule material and a maximum insertion loss of 0.5 dB. Connectors shall meet performance standards of EIA ANSI/TIA/EIA-568A.

2.10 **Warning Tape** Marking and locating tape shall be acid and alkali resistant polyethylene film, 6 inches wide designed for this purpose. The tape shall be manufactured with integral wires, foil backing, or other means to enable detection by a metal detector. The warning tape shall be orange in color and continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW".

3.0 EXECUTION

3.1 **Installation:** All installation work shall be done in accordance with the safety requirements set forth in the general requirements of IEEE C2 and NFPA 70.

3.1.1 **Cable Inspection and Repair** All cable and wire used in the construction of the project shall be handled with care. Each reel shall be inspected for cuts, nicks or other damage. All damage shall be repaired to the satisfaction of the Contracting Officer. The reel wrap shall remain intact on the reel until the cable or wire is ready to be placed.

3.1.2 **Buried Cable** Buried cable installation shall be accomplished in accordance with RUS REA Bulletin 1751F-641.

3.1.2.1 **Cable Depth** Cables placed in soil shall be at a minimum depth of 24 inches. Cables placed at ditch crossings shall be at a minimum depth of 36 inches. A plastic warning tape shall be placed above the cable at approximately 18 inches below ground level. Cables placed in rock shall be at a minimum depth of 6 inches.

3.1.2.2 **Above Ground Cable Protection** Cable installed on the outside of buildings, less than 8 feet above finished grade, shall be protected against physical damage.



3.1.2.3 Telephone Cable Bends Telephone cable bends shall have a radius of not less than 10 times the cable diameter.

3.1.2.4 Penetrations in walls, ceilings or other parts of the building, made to provide for cable access, shall be caulked and sealed. Where conduits and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials. Fire stopped penetrations shall not compromise the fire rating of the walls or floors. All underground building entries shall be through waterproof facilities.

3.1.2.5 Cable Protection Unless otherwise shown or specified, direct buried cable shall be protected in accordance with Table 300.5 of NFPA 70. Where additional protection is required, cable may be placed in galvanized iron pipe (GIP) sized on a maximum fill of 40% of cross-sectional area, or in concrete encased 4 inch PVC pipe. Conduits shall extend at least 6 inches per 12 inches burial depth beyond the edge of the surface where cable protection is required; all conduits shall be sealed on each end. Conduit may be installed by jacking or trenching.

3.1.2.6 Backfill for Rocky Soil When placing cable in a trench in rocky soil, the cable shall be cushioned by a fill of sand or selected soil at least 2 inches thick on the floor of the trench before placing the cable or wire. The backfill for at least 4 inches above the wire or cable shall be free from stones, rocks, or other hard or sharp materials which might damage the cable or wire. If the buried cable is placed less than 24 inches in depth, a protective cover of metal or concrete shall be used.

3.1.3 Underground Cable Underground cable installation shall be accomplished in accordance with the requirements set forth in RUS REA Bulletin 1751F-641.

3.1.4 Aerial Cable Aerial cable installation shall be accomplished in accordance with the requirements set forth in RUS REA TE&CM 635-03.

3.1.5 Surge Protection Except for fiber optic cable, all cables and conductors, which serve as communication lines, shall have surge protection meeting the requirements of RUS REA PE-60 installed at the entry facility.

3.2 Conductor Splicing:

3.2.1 Copper Conductor Splices Copper conductor cable splicing shall be accomplished in accordance with RUS Bulletin 1753F-401(PC-2). Modular splicing shall be used on all cables larger than 25 pairs.

3.2.2 Fiber Optic Splices Fiber optic splicing shall be in accordance with the manufacturer's recommendation; each splice shall have a loss of less than 0.1 dB.

3.3 Grounding: shall be in accordance with requirements of NFPA 70, Articles 800-33 and 800-40.

3.3.1 Ground Bars

3.3.1.1 Telecommunications Master Ground Bar (TMGB) A copper TMGB shall be provided, in accordance with EIA ANSI/TIA/EIA-607, to be the hub of the basic grounding system by providing a common point of connection for ground from outside cable, MDF, and equipment. The TMGB shall have a ground resistance, including ground, of 10 ohms or less.

3.3.1.2 Telecommunications Ground Bar (TGB) Copper TGB shall be provided in accordance with EIA ANSI/TIA/EIA-607 in each communications closet and room and each frame. The TGB shall be connected to the TMGB in accordance with EIA ANSI/TIA/EIA-607. Each TGB shall be connected to the

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TMGB by the most direct route utilizing a copper wire conductor with a total resistance of less than 0.01 ohms.

3.3.2 Incoming Outside Plant Cables All incoming outside plant cable shields shall be bonded directly to the TMGB or the closest TGB.

3.3.3 Cable Stubs All shields of cable stubs shall be bonded to a TGB located on the frame.

3.3.4 Shields The shields of all incoming cables shall not be bonded across the splice to the cable stubs.

3.3.5 Protection Assemblies The protector assemblies shall be mounted directly on the vertical frame ironwork. The assemblies mounted on each vertical frame shall be connected with a No. 6 AWG copper conductor to provide a low resistance path to the TGB.

3.3.6 Manholes The shields of all cables in each manhole shall be bonded together by a bonding wire or ribbon. At intermediate manholes, where the cable is pulled through without a sheath opening, bonds are not required. If the manhole has a lacerating bonding ribbon, the shields of spliced cables shall be attached to it.

3.4 Acceptance Tests: The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test; testing shall not proceed until after the Contractor has received written Contracting Officer's approval.

3.4.1 Copper Conductor Cable The following acceptance tests shall be performed in accordance with RUS REA PC-4:

- a. Shield continuity.
- b. Conductor continuity.
- c. Conductor insulation resistance.
- d. Structural return loss.
- e. Cable insertion loss and loss margin at carrier frequencies.
- f. Shield ground for single jacketed cables.
- g. DC loop resistance.

3.4.2 Fiber Optic Cable

3.4.2.1 Optical Time Domain Reflectometry (OTDR) Test The OTDR test shall be conducted in accordance with EIA ANSI/EIA-455-81A for single-mode fiber and EIA ANSI/EIA/TIA-455-78A for multi-mode fiber. Splice losses shall not exceed 0.1db. Attenuation losses shall not exceed 0.5 db/km at 1310 nm and 1550 nm for single-mode fiber. Attenuation losses shall not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for multi-mode fiber.

3.4.2.2 Attenuation Test The measurement method shall be in accordance with EIA ANSI/EIA/TIA-455-53A.

3.4.2.3 Bandwidth Test The bandwidth measurements shall be in accordance with EIA ANSI/EIA/TIA-455-30B.



SECTION 16820 CATHODIC PROTECTION SYSTEM FOR UNDERGROUND UTILITIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cathodic protection systems for underground utilities. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Contractor's Qualification: A qualified person, such as a NACE-accredited Corrosion Specialist or a Senior Corrosion Technologist, is required to perform or supervise the inspection of the cathodic protection system. The contractors making the repair and installation of new equipment, materials, or components shall be under the direct supervision of a NACE accredited Corrosion Specialist or a Senior Corrosion Technologist.

2.2 Standard Products: Materials and equipment to be used in the repair or replacement of a cathodic protection system shall be a product of a manufacturer regularly engaged in the manufacture of the product, shall meet the NACE requirements, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

3.0 EXECUTION:

3.1 Inspection: A complete inspection of the system shall be made in compliance with NACE RP0169. All findings shall be made in the form of a written report as directed by the Contracting Officer.

3.1.1 Sacrificial (Galvanic) Anode System: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil (electrolyte) potentials indicate that a neighboring structure is being made more positive, bonding shall be required to avoid damage.

3.1.2 Impressed Current (Rectifier Ground Bed) System:

3.1.2.1 Component Inspection: Make inspection of the individual components to ensure that all parts are operating properly. The inspection shall include, but not be limited to, checking unevenness of the temperature or the stacks, hot or warm joints or contacts, arc burn paths, discolored insulators, watt-hour meter for creep, poor insulation, faulty lightning arresters, fuses, and cleanliness of the rectifier stack.

3.1.2.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.

3.1.2.3 Interference Tests: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil potentials indicate that a neighboring structure is being made more positive, the Contractor must make recommendations in report to avoid damage.



3.2 Maintenance and Repair: After the installation of anodes, the Contractor shall inspect the system and reinspect it again 2 to 4 weeks later. In the event that the system, when repaired, will not provide the required protection, as evidenced by the final tests and measurements, the Contractor, together with the Contracting Officer, shall determine the cause of the deficiency and the corrective measures necessary. After the necessary corrective measures have been determined, the contract may be modified as required. All repair or replacement material/equipment shall be NACE approved and similar to original materials. Installation shall be in compliance with the recommendations of the manufacturers as approved by the Contracting Officer to comply with the contract documents. Replacement materials that are installed shall comply with the applicable portions of NACE RP0169.

3.2.1 Sacrificial (Galvanic) Anode System:

3.2.1.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures found in NACE RP0169.

3.2.1.2 Anode Output Adjustment: If required, install a resistor or resistance wire to prevent the anode from delivering excess current. The resistance wire, if used, shall be a nichrome wire, No. 16 or 22 AWG with type TW insulation.

3.2.1.3 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2 Impressed Current (Rectifier Ground Bed) Systems:

3.2.2.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures in NACE RP0169.

3.2.2.2 Installation: Install anodes similarly to the anodes in the initial installation. Replacement anodes are normally installed in auger-bored holes drilled adjacent to the damaged or deteriorated anode. Install anodes below the center line of the protected structure. Anodes may be installed horizontally if obstructions are encountered. Backfill material shall consist of coke breeze compacted in 6-inch layers. Foreign material shall be excluded from the backfill.

3.2.2.3 Electrical Splices and Connections: Negative cable connections shall be thermit-welded in compliance with the weld manufacturer's instruction. Cover the connection with an approved backfill shield placed over the weld connection. The shields shall be sized to cover the exposed metal.

3.2.2.4 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2.5 Interference Testing: Make interference testing on all structures installed under this contract to locate damage being caused by existing or new impressed current cathodic protection systems or other sources of interference. It shall be the Contractor's responsibility to correct all interferences.

3.3 Maintenance and Operating Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as manufacturers' data on installed equipment, operating instructions, lists of repair parts, names and addresses or sources of parts and services, current price lists, repair and maintenance instructions, construction specifications and shop drawings, and as-built drawings of the system.



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3.3.1 Consolidation of Records: The Contractor shall consolidate all cathodic protection records including surveys, inspections, operating data, maps, charts, location of leaks (leak maps), and manufacturers' parts manual.

3.3.2 Updating Records: Update existing cathodic protection location maps to show any changes in location or addition of test points or stations, anodes, wiring, etc.

3.3.3 Manuals: When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer six copies of operation and maintenance manuals of the cathodic protection system for guidance of using agency personnel. Prepare manual with contents as determined by the Contracting Officer.



SECTION 16821 CATHODIC PROTECTION OF STEEL WATER TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of cathodic protection of steel water tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Contractor's Qualification: A qualification such as NACE accredited corrosion specialist or a Senior Corrosion Technologist is required to perform or to supervise the inspection of the cathodic protection system. The contractor making the repair and installing new equipment, materials, or components shall be under the direct supervision of a NACE accredited corrosion specialist or a Senior Corrosion Technologist.

2.2 Approval: All repair or replacement material and equipment shall be NACE approved.

3.0 EXECUTION:

3.1 Inspection: The inspection of the cathodic protection system shall be made in compliance with applicable NACE standards. The inspection shall include a potential profile of the submerged structures together with visual and electrical tests.

3.1.1 Tank-to-Water Potential Tests: Adjust the rectifier voltage or amperage so as to satisfy design current densities or specified voltage. Document readings, and note any reading below -0.85 volts versus the copper-copper sulfate half-cell or silver-silver chloride half-cell (using conversion chart). Successive potential readings shall be made with the tank full of water and the reference electrode placed at various depths, starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. (A vertical inspection profile shall be taken along the wall between each anode string.) The tank bottom shall also be traversed equidistant from all distributed anodes. Inspect risers by placing reference electrode along the side wall of the riser and measuring at 3-foot intervals as far as possible.

3.1.2 Polarization of the submerged steel surfaces to a tank-to-water potential shall be at least a negative 0.85 volts.

3.1.3 Voltage Measurements Between Tank and Electrode: When inspecting new well-coated tanks, the voltage measured between the tank and reference electrode that is placed at any point along the coated surface shall not exceed negative 1.2 volts.

3.1.4 The Rectifier shall be free from any restriction that inhibits free air circulation. Keep air-cooled rectifiers free from dust accumulation, clogged filters or screens, brush, grass, or nests. Fill oil-cooled rectifiers to the proper level, and change the oil when it becomes cloudy. Dispose of oil that is removed as directed by the Contracting Officer.

3.1.4.1 Output Measurement: Measure and record the current and voltage output. Compare the readings obtained against the previous readings.



3.1.4.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.

3.1.4.3 Meter Tests: Check the meters in the rectifier for accuracy by using portable instruments (voltmeter and ammeter) of known accuracy.

3.1.5 Visual Inspection of the water tank shall be conducted while the Contractor is inspecting the anodes and wiring. At the direction of the Contracting Officer, lower the water level to expose as much of the wiring as practical to inspect for deteriorated insulation, faulty connections, etc. Inspect the interior surface for condition of coating and apparent rust or calcareous build up. In systems using permanent anodes, determine if the anode shall last until the next inspection. Record broken, damaged, and missing anodes. Inspect wiring to the anodes. Replace wire that has deteriorated insulation.

3.1.6 Reference Electrodes and Connecting Wires shall be inspected by the Contractor to determine whether they are capable of operation until the next annual inspection.

3.1.7 Reports: Record and submit all data. Corrosion control records shall follow recommendations found in NACE RP0169.

3.2 Maintenance and Repair:

3.2.1 Compliance: The maintenance, repair, and installation of replacement materials shall be in compliance with accepted NACE practices. Install all materials and equipment in compliance with the recommendations of NACE or the manufacturer or to comply with the contract documents. Contractor shall replace all broken, missing, deteriorated, or otherwise unserviceable components determined during inspection.

3.2.2 Workmanship: The maintenance, repair, and installation of repair materials shall be under the supervision of the Contractor's NACE Accredited Corrosion Specialist or Senior Corrosion Technologist. Installation shall be performed by personnel who are specifically trained in this work by the manufacturer and who are engaged full time in the installation and servicing of cathode protection equipment. Electrical work shall be in compliance with the requirements of the National Electrical Code.

3.2.3 Testing Methods: Upon completion of repair, the Contractor shall test, adjust, and place in service the cathodic protection system by the following methods:

3.2.3.1 Testing: Adjust the voltage of the rectifier so as to cause a sufficient current to flow to polarize all parts of the structure to at least -0.85 volts. With a given amount of current flowing, voltage measurement shall be made from the tank to a copper-sulfate reference electrode in contact with the water. Successive potential readings shall be made with a calibrated voltmeter, with the tank full of water and the reference electrode placed at various depths starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. The tank bottom shall also be traversed and readings taken every 3 feet in a single horizontal direction. In making these tests, place the reference electrode midway between two tank anodes and suspend close to, but not touching, the side or bottom of the tank. The distance between the reference electrode and the wall shall not exceed 1 inch for all readings. If any parts of the structure register voltages more negative than minus 1.2 volts, note this in a deficiency checklist.

3.2.3.2 Rectifier Adjustment: Final adjustment of the rectifier output current shall be made so that repeated voltage readings taken as specified above for testing fall between the limits of minus 0.75 to minus 1.2 volts when measured against the reference electrode.

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3.2.3.3 Signs: The Contractor shall paint or stencil his name, date of inspection of the system, and due date of next inspection at a place on site designated by the Contracting Officer.

3.2.3.4 Reports: After final adjustment, place the cathodic protection system in service, record the conditions of the system as left by the Contractor, and submit the report to the Contracting Officer.

3.3 Operating and Maintenance Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as: manufacturer's data on installed equipment, operating instructions, lists of repair parts, names and addresses of sources of parts and services, current price lists, repair and maintenance instructions, and construction specifications and shop drawings. When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer two complete sets of typewritten or printed instructions covering the maintenance and operation of the installation. The instructions shall cover proper adjustment of the direct current flow, a brief description of cathodic protection principles, a single line operating diagram, anode consideration with reference to local freezing conditions, trouble-shooting checklists, and any other pertinent information concerned with the proper care and maintenance of the installation.



SECTION 16825 FIRE ALARM AND DETECTION EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire alarm and detection equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Control Unit and Annunciator: FM Approval Guide, UL 864.

2.2 Lamps shall be long-life neon.

2.3 Contacts shall be rated 5 amperes, 120 volts.

2.4 Power Supply shall be solid-state, UL 864 for dc systems, FMS for ac systems. No attempt to repair solid-state components shall be made.

2.5 Heat Detectors:

2.5.1 Fixed Temperature, Self-Restoring Heat Detector shall have bimetallic element to close electrical contacts when heated.

2.5.2 Combination Fixed Temperature and Rate-of-Rise, Self-Restoring Heat Detector shall have both a bimetallic element to close electrical contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moisture-proof vent. Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate of temperature rise exceeds 15 F per minute.

2.5.3 Fixed Temperature Rate Compensated Heat Detectors shall have an expansible outer shell sensitive to surrounding air temperature, which compensates for thermal lag of external temperature.

2.5.4 Fixed Temperature, Nonrestorable Heat Detector shall have phosphor bronze spring held under tension by a fusible link to hold open contacts. Indicator hole shall appear in the detector chamber seal to indicate the fired detector.

2.5.5 Combination Fixed Temperature and Rate-of-Rise, Nonrestorable Heat Detector shall have a phosphor bronze spring held under tension by a fusible link to hold open contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moisture-proof vent. Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate of temperature rise exceeds 15 F per minute.

2.6 Flame Detector shall consist of a silicon photo-electric cell located behind a convex, infrared filter lens. Time delays to prevent false actuation shall be three seconds, ten seconds, or thirty seconds.

2.7 Fire Alarm Transmitters and Receivers:

2.7.1 Emergency Power Supply shall be a completely automatic unit consisting of batteries, battery charging unit to automatically maintain the batteries, and an inverter to change dc battery power to 120 volt, 60 hertz ac power.

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2.7.2 Control Relays: Replacement relays shall be totally enclosed with heat and shock-resistant dust covers.

2.7.3 Trouble Buzzer shall be integrally mounted in the control unit.

2.8 Single Station Smoke Detectors (Self-Contained):

2.8.1 Detector Base shall be plug-in type plastic base.

2.8.2 Detectors shall be self-contained control unit that accepts either ionization, photo-electric, or flame detectors. Ionization detectors shall be of the dual chamber type. Ionization detectors shall comply with UL 268 and UL 217. Photo-electric detectors shall comply with UL 268.

2.9 Duct Smoke Detectors shall be either ionization type or photo-electric type. Ionization detector shall be of the dual chamber type. Ionization detectors shall comply with UL 268 and photo-electric detectors shall comply with UL 268.

2.10 Interlocks:

2.10.1 Contact Rating: At 277 volts, contacts shall be rated 15 amperes at 75 percent power factor.

2.10.2 Horsepower Rating: Contacts shall be rated for 1-1/2 horsepower at 230 volts.

2.10.3 Contact Voltage: Minimum contact voltage rating shall be 277 volts.

2.10.4 Coil Voltage shall be selected to suit voltage of system.

2.11 Batteries: ULC listed.

2.12 End-of-Line Resistors, Balancing Resistors, and Diodes: Compatible with system installed.

2.13 Manual Stations: UL 38, flush or semi-flush mounted, pull-lever type.

2.14 Wiring: NFPA 72A and 72D.

2.15 Audible Alarms: UL listed for fire protection service, UL 464/486N.

3.0 EXECUTION:

3.1 Coordination: Prior to commencement of work in any facility having any form of fixed fire protection, contact the fire department. Contractor shall determine that disconnection of equipment will not create a false alarm.

3.2 Workmanship: NFPA 70, 72A, 72D, and 72E.

3.3 Defective Ionization Detectors that are replaced shall be returned to manufacturer for proper disposal.



SECTION 16830 ELECTRIC UNIT HEATERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Heating Element shall have nickel-chromium wire packed in high purity magnesium oxide enclosed in a corrosion-resistant sheath. The embedded sheath shall be the manufacturer's standard design.

2.2 Housing shall be fabricated from sheet steel complying with ASTM A 569. The housing shall be provided with means for suspension. Deflector blades shall be constructed of same material as housing and shall be manufacturer's standard design and operation.

2.3 Fan shall be the propeller type fabricated of aluminum or steel.

2.4 Controls:

2.4.1 Thermal Overload Cutout of the Manual Reset Type shall be provided to disconnect elements in the event normal operating temperatures are exceeded.

2.4.2 Thermostat shall be unit or wall mounted and shall be heavy-duty type with enclosed contacts as specified by the manufacturer, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

2.5 Asbestos Usage: Materials containing asbestos shall not be used.

3.0 EXECUTION:

3.1 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.

3.2 Workmanship: Installation work shall be in compliance with the National Electric Code.

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SECTION 16840 LIGHTNING ARRESTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of lightning arresters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Arresters shall comply with ANSI/IEEE 28 and ANSI C62.2.

3.0 EXECUTION:

3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.

3.2 Workmanship shall be in compliance with ANSI C2.

3.3 Cleaning: Clean work areas and materials of dirt, grime, grease, and debris.

3.4 Expulsion Arresters shall be inspected for depleted fiber material and thin walls. Report deficiencies to the Contracting Officer.



SECTION 16845 NURSE CALL SYSTEM

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for new and/or repair and maintenance of nurse call systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 System Equipment:

2.1.1 General Each nursing unit or other specifically dedicated system shall have its equipment located in or near the associated console, where shown. The equipment shall include all devices, components, and wiring necessary to perform the functions specified. If the equipment space or power requirements exceed that shown, necessary adjustments to the installation to accommodate the equipment shall be made as approved.

2.1.2 Materials and Equipment Units of the same type of equipment shall be products of a single manufacturer. Each major component of equipment shall have the manufacturer's name and address, and the model and serial number in a conspicuous place.

2.1.3 Cabinet Wiring Items, devices and components shall be securely mounted, identified, and conveniently arranged for servicing. Wiring shall be secured on identified terminals, color coded or otherwise identified, and shall be neatly formed, cabled, and laced or clamped in position in the cabinet. Operating controls and devices shall be located in a single unit nurse control station. The nurse control station shall be enclosed in a desk-top box with a plastic laminate finish in an approved color, and shall be cable connected to the control cabinet.

2.1.4 Central Control Console Operating controls and displays required at the central console shall be housed in a desk top console. The balance of the equipment shall be provided in either free-standing or flush-mounted cabinets arranged to provide adequate ventilation. When selected, twin operating controls shall be incorporated into the console. Each separate control shall be capable of operating independently or in concert with the other. These two controls, in combination, shall function in exactly the same manner as a single console.

2.1.5 Central Processor The central processor shall function as the overall system coordinator, controlling peripheral devices, and performing alarm reporting and logging events. The central processor shall have plug-in expandability within its single housing to handle additional nursing units, and patient and staff and duty stations. The central processor shall be a single manufacturer's standard unmodified digital computer of modular design, greater than 500mhz processor speed, and 17inch or larger color monitor. The central control unit shall not include any hardware that would preclude the purchase of a standard maintenance and service contract from the computer manufacturer.

2.1.6 Logging Printer A color inkjet printer compatible with software, capable of printing on continuous paper, complete with stand and paper tray, shall be provided with the central operators terminal.

2.1.7 Patient's Bedside Station The bedside station shall perform the functions specified. Each station shall consist of a flush-mounted back box, an equipment sub-mounting plate, and either a satin finish stainless steel, or an ABS or equal plastic face plate. Face plates shall have beveled edges, mounted on the

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outlet box with countersunk corrosion-resisting steel screws. Neuro-psychiatric area stations shall be provided with tamper-proof screws. A light shall be provided on the face plate to indicate communication with the central console. Mounting height shall be 4.5 feet above the floor, or as shown. Station shall include a pillow speaker cord set as specified, except that the pediatric area system shall be provided with a standard cord set.

2.1.8 Calling Stations shall perform the functions specified. Each station shall consist of a flush-mounted back box, an equipment sub-mounting plate, and either a satin finish stainless steel, or an ABS or equal plastic faceplate. Faceplates shall be mounted on the outlet box with countersunk corrosion-resisting steel screws. The mounting height shall be 4 feet 6 inches above the floor or as shown.

2.1.8.1 Duty Station (Type A) shall have mounted in the faceplate, one non-locking call button, one white call-placed lamp, one speaker/microphone, and electronic tone. The tone may be separately mounted 7 feet 6 inches from the floor, directly above the duty station, provided additional rough-in is provided.

2.1.8.2 Emergency Station (Type B) shall be either pull cord or push button type. The pull cord locking-type shall be mounted 4 feet from the floor and shall contain a manual reset button, red call-placed lamp and locking type switch. Station shall be clearly identified as a calling station with manufacturer's standard lettering on the plate. The push button type shall have a locking type push button mounted 4 feet above the floor or as shown. A red indicator light shall flash when the push button is operated.

2.1.8.3 Shower Station (Type C) shall be identical to emergency station except it shall be waterproof.

2.1.8.4 Toilet Station (Type D) shall be identical to emergency station, except it shall be push button type.

2.1.8.5 Staff Station (Type E) shall be identical to the duty station, except the tone will not be required.

2.1.8.6 Elbow Station (Type F) shall be identical to the emergency station, except it shall be a maintained contact elbow switch type.

2.1.8.7 Delivery-Room and Nursery Station (Type G) shall consist of a staff station, a foot-operated [explosion-proof] switch and an elbow station. Wall mounted equipment will be mounted 4 feet above the floor or as shown.

2.1.8.8 Surgery Station (Type H) shall be identical with the delivery room station.

2.1.8.9 Neuro-psychiatric Stations (Type I) shall consist of tamperproof ceiling speakers, tamperproof emergency button mounted in the patient's room, and a keyed switch mounted outside the patient's door.

2.1.8.10 Radiology Station (Type J) shall include a visual display only, dome lights, pull cords, tone, and illuminated panel showing the room numbers of placed calls. The illuminated panel shall be located at the radiology control point. The tone annunciator shall be located adjacent to the dome light.

2.1.9 Dome Lights shall be mounted 7 feet 6 inches from floor or as shown, and shall consist of a satin finish stainless steel, or an ABS or equal plastic faceplate with translucent glass or plastic dome, mounting one or more 24-volt lamps. Where more than one lamp is required in a single dome, barriers or prismatic light control shall be provided to make the individual lamp signals discernible. Particular care shall be used in mounting to ensure that all lamp signals shall be distinctly visible in all directions.

2.1.9.1 Dome Light, Type I shall be used with patient rooms and shall include three lights, with capability of steady signal and flashing signal. Lights shall provide white, red, and green signals.



2.1.9.2 Dome Light, Type II shall be generally used with toilet, tub, or shower rooms in the surgical suite and the emergency room, and shall have red light.

2.1.9.3 Dome Light, Type III shall be used with staff registration stations and shall have three lights: white, red, and green.

2.1.10 Staff Registration Station shall be mounted 4 feet above floor and shall consist of a flush-mounted box, an equipment sub-mounting plate, and either a satin finish stainless steel, or an ABS or equal plastic faceplate. Station shall have momentary push buttons for RN, LPN or aide which shall be used for both "in" and "out" registration. Activation of these devices, at a minimum, shall register the staff person into the room, light a corresponding light on the registration station and the corridor dome light.

2.1.11 Audio System Each area system shall include an audio system designed to provide clear, distinct two-way voice communication. Reproduction of sounds shall be of such fidelity as to provide pick-up of normal conversations anywhere in the room. The patient shall be able to converse with a calling station without moving in bed, or directing patient's voice toward a microphone or without raising the voice above a normal speaking level.

2.1.11.1 Amplifier An audio amplification system shall be included in each nurse station. The amplifier shall provide the fidelity and overall gain necessary to achieve the sound transmission and reproduction characteristics specified with all speakers/microphones and wiring provided. Power output shall be not less than 3 watts at a total distortion not exceeding 5 percent. Hum and noise level shall be at least 60 dB below full output with normal input open. Two independent volume controls shall be provided; one shall be accessible on the nursing area's console and shall control the volume of sound reproduced at the console. The other shall be a concealed control within the amplifier unit to control the volume of sound reproduced at all other stations. The individual remote stations shall include, if necessary, a means of adjusting the sound level at the individual stations while maintaining properly matched input and output impedances. Adjustment shall also be provided for the automatic compensation of volume when group monitoring selectors are used. A nonlinear voice emphasis or tone-compensation circuit may be included in the amplifier to secure improved speech response, but this circuit shall include a cutoff to provide the linear response specified. All such semi-permanent adjustments shall be made by a qualified technician when the system is placed in service and shall be concealed and inaccessible to other persons. The amplifier shall be adequately ventilated, rigidly constructed, neatly wired and arranged for servicing, with all removable components and all terminals permanently identified. The amplifier may be located in the remote control unit or in a separate wall cabinet. Protection to prevent damage to the amplifier in case shorted or open output should occur shall be provided.

2.1.11.2 Speaker/Microphones Speaker/microphone shall be permanent-magnet dynamic or ceramic type, protected against dust and humidity. Magnet and voice coil shall be held concentric by a rigid frame. The speaker shall be capable of reproducing a sound level of 90 dB plus or minus 3 dB, (at a distance of 4 feet on the axis without overdriving or distorting any frequencies between 300 and 3000 Hz) when installed in an enclosure or in the pillow speaker. Speaker shall not be susceptible to damage from overdriving within the range of power available from the amplifier and circuits provided. Speaker/microphones shall be coordinated and matched to the input and output circuits of the amplifier, both for single connection and for group monitoring, to provide the sound reproduction specified. Subsystems or components shall not be combined which could cause unacceptable distortion such as feedback between pillow speakers and unmuted room speaker/microphone combinations. This protection shall extend throughout the entire range of operation (volume control) of all components.

2.1.11.3 Telephone Handsets or Headsets Handsets or headsets shall not have a press-to-talk switch and shall be coordinated with input and output of amplifier. Two plug-in sets shall be provided for each console.

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2.1.12 Cord Sets Each set shall be 6 feet long and equipped with a corrosion-resisting bed clamp. A hook or other means shall be provided to suspend cord sets when not in use. Use of magnets is not acceptable. Cord sets shall be impact-resistant. Cord set connections to the patient station wall plate shall be interchangeable and the full function or change in function shall result by only connecting the cord set. No external switching shall be required except special care station. Electrical cords shall be SVT, 2-conductor, No. 18 AWG copper, PVC insulated, twisted pair, with overall PVC jacket, suitable for operation from 68 to 140 degrees F, and UL listed as a hospital lamp or vacuum cleaner cord. Each cord set shall be provided individually packaged and identified complete with an itemized list.

2.1.12.1 Pillow Cord Sets Pillow speaker shall include facilities to place call to central console, turn a TV set on and off, change TV channels, regulate the TV volume, and communicate with the console. The program entertainment shall be muted during patient/nurse communication.

2.1.12.2 Standard Cord Sets shall be the momentary action type with a non-locking call button and jack molded onto the cord.

2.1.12.3 Low Pressure Pneumatic Cord Set Sets shall be of the momentary action type. The concentric plug shall be molded onto the cord. The pressure tube shall be constructed of flexible plastic, suitable for use in an oxygen atmosphere. The outer jacket button housing shall be polyethylene plastic.

2.1.13 System Power Supply The system power supply shall be surface mounted, located as shown and shall supply 24 Vdc power for operation of the call system. The supply shall operate between 32 and 120 degrees F on a continuous duty basis from a primary line voltage between 105 to 125 Vac, 60 Hz. The output shall be regulated 24 Vdc with protection against overloads. Line to load regulation shall not exceed 2-1/2 percent with ripple and noise remaining below the 10 mV rms level. Output protection against overload or shorts shall be provided by an electronic fold-back circuit set to limit the volt-ampere output to less than 100 VA. The power output shall be restored automatically upon removal of overload without resetting circuit breakers or replacing fuses.

2.1.14 Standby Power Supply A standby power supply shall be provided and mounted into the same backbox as the systems power supply providing full, uninterrupted operating power to the system in case of primary power or power supply failure. Failure of primary ac power or failure of the system power supply shall cause the standby supply to automatically transfer into the system without interruption and maintain full operation of the system, both light/tone signals and two-way voice communication. The output shall maintain 24 Vdc at full load for a minimum of 6 minutes. The standby shall then automatically transfer out of the system. The battery pack shall be completely sealed and require no maintenance or periodical discharge and recharge cycling. The battery shall be protected against system overload or shorts. A built-in float charger operating from 120 Vac shall be provided to float charge the batteries during normal operating conditions. Control terminals shall provide remote light and tone indications for primary or supply failure, system overload or shorts, and/or battery disconnect.

2.2 Materials:

2.2.1 Cabinets and Special Back Boxes Cabinets and boxes shall be provided to suit the equipment, and shall be metal enclosures with covers in accordance with UL 1069 and UL 50. The Contractor shall provide the correct boxes for all nurse call equipment.

2.2.2 Cabinet Rim and Faceplates Rims and faceplates shall be provided to suit the equipment, and shall be satin-finished corrosion-resisting steel with beveled edges.



2.2.3 Cables and Conductors Cables and multi-conductor wiring, shielded and unshielded, for low-voltage signaling and audio circuits shall be provided to suit the equipment. Coaxial and shielded cable shall be type and size as recommended by the system manufacturer.

2.3 Diagnostic Programs: Diagnostic programs that will report all failures of the system and failures of peripherals on the system shall be provided.

3.0 EXECUTION

3.1 Installation: The installation of the system described shall be performed in accordance with manufacturer's instructions.

3.1.1 Electrical Work Raceways, outlet boxes, pull boxes, and power conductors shall be in accordance with Section 16051 Wiring Systems Equipment and NFPA 70.

3.1.2 Grounding Equipment enclosures and all other non-current carrying metal parts of electric equipment shall be grounded.

3.1.3 System Wiring System wiring shall be in accordance with UL 1069, and NFPA 70. Where multi-conductor or coaxial cable is used, installation, wiring and connections shall be in accordance with manufacturer's instructions and diagrams.

3.2 Tests: The Contractor is responsible for providing all personnel, equipment, instrumentation, and supplies necessary to perform all testing. Notification of any planned testing shall be given to the Government at least 15 days prior to any test. In no case shall notice be given until after the Contractor has received written Government approval of the test plans and procedures as specified. After the installation is completed and approval received, the Contractor shall conduct operating tests for approval and acceptance. Parts and components that fail during the tests shall be replaced with new parts. The Contractor shall furnish instruments and personnel required for the tests, and the Government will furnish the necessary electric power.

3.2.1 Zone and Subsystem Each zone and subsystem shall be demonstrated to function as specified by operation of each individual system component under simulated normal system loading.

3.2.2 Nursing Units Each nursing unit and subsystem to be interconnected with one or more additional areas or to the central console shall be demonstrated to function as specified by operation of each individual system component under simulated normal system loading.

3.2.3 Central Console Equipment shall be programmed to demonstrate all display functions, methods of response to individual system calls, system data printout, and all other operations specified.

3.2.4 CPU Diagnostic System shall be demonstrated by utilizing the diagnostic software programming. Systematic test routines are to be activated by entering the appropriate test number at the nurse console keypad. The test parameters are to be displayed either at the nurse console or monitored with a meter on special test boards included in the test set. Demonstrate operation of each function.

3.2.5 Audio Tests The satisfactory operations, adjustment, and sensitivity of each station shall be demonstrated. Defective connections, hum, weakness, or excessive volume of individual stations shall be corrected. Field tests shall be made of the completed installation to demonstrate the following:

- a. Output from speaker, 90 dB plus or minus 3 dB, 300-3000 Hz, reference level threshold of audibility 0 dB at 0.0002 dyne/sq. cm. sound pressure.
- b. Gain from patient's bedside station to nurse station, 65 dB (plus or minus 3 dB, 300-3000 Hz).
- c. Hum and noise level at least 45 dB below full output with system connected.

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d. Amplifier output of at least 3 watts at less than 5 percent distortion.

3.2.6 Tests shall be conducted using a calibrated tone generator producing octave and half-octave tone intervals from 100 to 6400 Hz 4 feet from the microphone on the axis, and using a standard calibrated sound-level meter on the dB "A" scale, 4 feet from the axis of the speaker. Microphone amplifier and speakers shall be connected as in service with at least 75 feet of cable and with six dome lamps and one emergency call operating.

3.3 Training Courses: The Contractor shall conduct two training courses. One 8-hour training course shall be for the nursing staff, the other will be a 8-hour technical course for the maintenance staff. The training periods shall start after the system is functionally complete, and immediately prior to the final acceptance tests. Each course shall cover all items contained in the operating and maintenance instructions. The Contractor shall also provide videotapes of each training course.



SECTION 16850 PUBLIC ADDRESS EQUIPMENT

1.0 DESCRIPTION OF WORK: The specification covers the furnishing and installation of public address equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Broadcast Microphone Cables: EIA RS-215.

2.2 Audio Cable Connectors: EIA RS-297.

2.3 Capacitors: EIA RS-153, RS-164, RS-198, and RS-395, as applicable.

2.4 Ceramic-Base Printed Circuits: EIA RS-161 and RS-162.

2.5 Component Parts: Standard test method of EIA RS-186.

2.6 Thermoplastic Hook-Up Wire: EIA RS-230 and ASTM B 286.

2.7 Inductors: EIA RS-175 or RS-197.

2.8 Loudspeakers: EIA RS-278 and RS-SE-103.

2.9 Microphones: EIA RS-SE-105.

2.10 Panel Mounting Racks: EIA RS-310.

2.11 Resistors: EIA RS-155, RS-172, RS-196, RS-303, RS-322, and RS-344.

2.12 Sound System: EIA RS-160.

2.13 Tape Equipment: NAB Magnetic Tape (Reel-to-Reel) Recording and Reproduction Standards.

2.14 Transformers: EIA RS-174, RS-180, RS-183, and RS-393.

2.15 AM-FM Tuners: The AM-FM tuners shall have a tuning range of 540 kHz to 1605 kHz for AM and 88 to 108 MHz for FM and shall comply with FCC Rules and Regulations, Part 15. Controls shall include AM-FM selector switch, power switch with pilot light, signal strength meter, and tuning control with illuminated dial scale.

2.16 Phonograph: Phonograph shall conform to the requirements of NAB Disc Recording and Reproducing Standard and shall play in the automatic and manual modes. The phonograph shall have two speeds of operation, 33-1/2 rpm and 45 rpm, adjustable over 3 percent of the range. Deviation from the mean speed (wow and flutter) shall not exceed 0.1 percent.

2.17 Magnetic Tape Equipment: Tape equipment shall be provided for monophonic recording and playback, of at least 30 dB dynamic range of input signal. The record and playback heads shall be separate

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with the playback head arranged to monitor while the recording is made. Hum and noise shall be at least 50 dB below full output.

2.17.1 Cassette Tape Equipment: Tape speed shall be 1-7/8 ips. Frequency response shall be within \pm 3 dB from 40 hertz to 14,000 hertz, with less than 0.16 percent wow and flutter. Signal to noise ratio shall be at least 50 dB.

2.17.2 Automatic Tape Reproducer: At a tape speed of 7-1/2 ips, the reproducer shall have a frequency response within \pm 2 dB from 40 hertz to 15,000 hertz. Wow and flutter shall be not greater than 0.25 percent; and signal to noise ratio, not less than 50 dB.

2.18 Preamplifiers:

2.18.1 Microphone Preamplifiers: If required, microphone preamplifiers shall be matched to the microphone.

2.18.2 Mixer Preamplifier: Preamplifier shall be of the general purpose type, to mix and control at least five inputs. Equalization shall meet the requirements of RIAA Publication, Standard Recording and Reproducing Characteristics. Preamplifier shall be provided with independent low-frequency and high-frequency tone controls to adjust bass and treble response at the output, a monitor volume control, monitor jack, illuminated volume unit meter, power switch, and master volume controls.

2.18.3 Radio Frequency Preamplifier: The preamplifier shall have a minimum of 14 dB gain over the FM band with a noise figure not greater than 4.2 dB.

2.19 Power Amplifiers: Frequency response shall be within \pm 1 dB from 25 hertz to 19,000 hertz, and total harmonic distortion shall not exceed 0.5 percent at rated output. Output shall incorporate automatic resetting, protective electronic circuitry to prevent amplifier damage of any kind due to amplifier output opens or shorts.

2.20 Equipment Racks: Equipment shall be mounted in 19-inch racks in accordance with EIA RS-310. Ventilated rear panels, solid side panels, and solid top panels shall be provided.

2.21 AM/FM Antenna. The AM/FM antenna shall be roof-mounted suitable for both AM and FM reception and shall cover all frequency bands specified for radio tuners. Coaxial cable attenuation shall not exceed 2.5 dB over the FM radio band.

3.0 EXECUTION:

3.1 Connections to Existing System: Alarm or emergency systems shall not be interrupted. If required, work shall be scheduled after normal working hours. Existing disturbed work shall be restored to its original condition, including maintenance of wiring continuity.

3.2 Temporary Shutdowns: Temporary shutdowns of existing systems shall be made at times that will not interfere with normal operation of existing facilities, and only with written consent of the Contracting Officer.



SECTION 16860 MASTER ANTENNA TELEVISION SYSTEM

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of master antenna television system. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Antennas used for television off-air reception shall be yagi log-periodic type. The antennas shall be cut-to-channel, or broadband models designed for heavy duty commercial use.

2.1.1 Off-Air Antenna Mechanical Specifications Crossarms shall be high-strength aluminum alloy, seamless, with ends sealed. Elements shall be high-strength aluminum alloy tubing. The antenna shall be rated for an operational/survival wind velocity of 100 mph with no ice. All antennas shall be completely weatherproofed. The aluminum shall have an electrically conductive anti-corrosion (anodized) finish. All metals for installation and mounting shall be high-strength noncorrosive type. No drilling shall be required for installation. The antenna cable connector shall be a built in, 75 ohm anodized brass, type F-61 connector.

2.1.2 Off Air Antenna Electrical Specifications The antenna shall as a minimum conform to the following specifications: Gain Front-to-Back:8 dBi, Ratio:18, Output Impedance: 75 plus or minus 2 ohms unbalanced, Maximum VSWR: 1.5:1, and Frequency Range: VHF, FM, and UHF.

2.1.3 Antenna Support Towers Antenna support towers shall be designed to EIA ANSI/EIA/TIA-222-F specifications and adhere to FAA AC 70/7460-1 and 47 CFR 17 requirements. Appropriate off-set antenna-tower mounts and downlead cable supports shall be provided.

2.1.4 Transmission Lines Transmission lines connecting the antennas and headend equipment shall be low-loss, foam dielectric coaxial cable.

2.2 Headend Equipment:

2.2.1 General The headend shall utilize channel mixers, processors for channel translation, broadband amplifiers, single channel amplifiers, and combining networks as selected for receiving off-air television and FM signals and interfacing them with the cable distribution system. Coaxial downloads of the off-air antennas shall be provided with preamplifiers as required to supply the proper signal level input required by the headend equipment. RF Modulators shall be supplied to modulate each satellite station to the appropriate channel as specified for system performance.

2.2.2 Off-Air Reception

2.2.2.1 Channel Mixers (Nonadjacent) shall as a minimum conform to the following specifications:

Insertion Loss (Maximum 54-216 MHz): 2.5 dB

Return Loss: 14 dB

Out-of-Band Rejection: 12 dB

Impedance: 75 ohms

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2.2.2.2 Processors A processor shall be required for each channel translation specified. Processors for channel translation shall, as a minimum conform to the following specifications:

Bandwidth:	6 MHz
Impedance (input and output):	75 ohms
Return Loss (within 6 MHz bandwidth):	16 dB
Max. Noise Figure (at maximum gain):	10 dB
Input Level Range:	VHF minus 20 to plus 30 dBmV - UHF minus 20 to plus 25 dBmV
Output Level Range:	50 to 60 dBmV
Carrier to Noise Ratio (with plus 10 dBmV input):	57 dB
AGC Regulation:	Plus or minus 1 dB output variation for rated input level range
variation Frequency Stability:	Plus or minus 10 KHz over operational temperature range
Spurious Output:	60 dB below video carrier with video carrier output level at plus 60 dBmV and audio carrier level at plus 45 dBmV.
Adjacent Channel Rejection:	Equal to or Greater than 60 dB

2.2.2.3 Broadband amplifiers shall, as a minimum conform to the following specifications:

Frequency Range:	[54-108, 174-220] [54-220] MHz
Frequency Response (Across Bandpass):	Plus or minus 1.0 dB
Impedance:	75 ohms
Maximum Noise Figure:	10 dB
Return Loss:	16 dB

2.2.2.4 Single Channel Amplifiers shall, as a minimum conform to the following specifications:

Frequency Range:	6 MHz for channel specified
Frequency Response:	Plus or minus 0.5 dB
Impedance:	75 ohms
Return Loss:	14 dB
Maximum Noise Figure:	10 dB
AGC Regulation:	Plus or minus 1 dB output variation for rated input level range
Skirt Rejection:	Minus 26 dB at plus or minus 9 MHz from channel center

2.2.2.5 The FM system shall, as a minimum conform to the following specifications:

a. System Specifications:

Input, Impedance:	75 ohms
Output level:	Plus 36 dBmV
Frequency:	88 - 108 MHz
Spurious:	Greater than 60c dB below signal level
Hum and Noise:	Greater than 60 dB below rated output
Oscillator Harmonics:	Greater than 60 dB below rated output

b. RF Module: One RF processor module shall be provided for each station in the FM broadcast band listed under system performance in paragraph. The RF modules shall, as a minimum conform to the following specifications:

Frequency:	88 - 108 MHz in or out as required
Output level-module:	Plus 52 dBmV
Output level control:	Plus or minus 10 dB
Stability:	0.005 percent, crystal
Limiting:	20 microvolts (minus 3 dB point)
Sensitivity:	3 microvolts for 30 dB quieting
Input level:	Minimum 40 microvolts monaural and 60 microvolts stereo
Image rejection:	90 dB



Passband: 200 kHz
Selectivity: Under plus or minus 150 kHz at 30 dB down Under plus or minus 250 kHz at 50 dB down (Greater selectivity optional)

2.2.3 Off-Air Reception

2.2.3.1 Channel Mixers (Nonadjacent) Channel mixers shall as a minimum conform to the following specifications: Insertion Loss: (Maximum 54-216 MHz): 2.5 dB, Return Loss: 14 dB, Out-of-Band Rejection: 12 dB, Impedance: 75 ohms.

2.2.3.2 Combining Network A signal-combining network (mixer) shall be provided to combine the VHF, CATV channels and FM broadcast band network into a single broadband signal. The combining network shall have an output test point, mixer output step attenuator, dual pilot insertion network, and removable mixer-to-trunk jumper. The combining network shall be rack mounted or wall mounted with the associated headend equipment and shall as a minimum conform to the following specifications:

Band pass: As specified for system performance

Flatness over any 6 MHz segment: Plus or minus 0.1 dB

Flatness 54 - 216 MHz: Plus or minus 0.5 dB

Maximum Insertion loss, (nominal)

Channel input to trunk output: 15 dB

Channel input to mixer output: 13 dB

Test point (loss from trunk output): 20 dB

Return loss: 16 dB on channels employed

Isolation between any two inputs: 30 dB

Impedance Input and output: 75 ohms

2.3 Cable Distribution Plant:

2.3.1 Inside Plant Cables All coaxial cables used for wiring within a building shall conform to NFPA 70. The inside plant cabling 0.500 inch OD or larger shall be nonjacketed with a bare outer conductor. Inside plant cables less than 0.500 inch OD shall be PVC jacketed and shall have a braided copper or aluminum outer conductor with 65 plus or minus 5 percent braid coverage. The inner conductor shall be copper clad steel wire or solid copper and an aluminum foil bonded to the outside of the dielectric. The cable shall have a polyethylene foam dielectric unless used in plenum applications. Where cabling is to be placed in plenum, ducts and other air-handling spaces the cable shall meet NFPA 70.

2.3.2 Signal Splitter The cable distribution system shall utilize signal power splitters, directional couplers, and isolation taps as required to meet the system performance requirements. Signal splitters shall have a power throughput capability of 6 amperes minimum when amplifiers are to be powered through the cable. All signal splitters shall be contained in rugged weatherproof anodized aluminum or other non-corrosive metal housing with brass connector ports. In addition to the above specifications, the splitters shall as a minimum conform to the following specifications: Impedance: 75 ohms unbalanced, Return Loss: 17 dB, RFI Shielding: 100 dB, and Isolation: 25 dB.

2.3.3 Outlets with plates shall be wall or baseboard] mounted and shall not protrude from the face of the wall more than 1/4 inch. Each outlet shall have an attenuation of less than 0.1 dB and a VSWR of less than 1.15 to 1. Cable Connectors shall be 75 ohm Type "F" or self-terminating units. All metallic portions of connectors shall be composed of anodized brass, beryllium copper or phosphorus bronze. Outlet connector shall be Type "F" female plug.

2.4 CCTV Cameras:

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2.4.1 Silicon-target, monochrome, charge-coupled-device imaging type with 0.5-inch pickup tube; capable of producing usable video images when used with f/1.4 lens with subject illumination ranging from 0.05 to 9290 fc.

2.4.2 Silicon-target, color, charge-coupled-device imaging type with 1/3-inch image format; capable of producing usable video images with only 0.07 fc and of automatically setting the color by a digital adjustment control.

2.4.3 Lenses shall be high-quality coated optics, matched to camera and designed specifically for TV camera application. Units shall have neutral-density spot filters and automatic iris controls. Fixed lenses shall be f/1.4 adjustable to f/22. Zoom lenses shall be "quiet operating" rated remote control units.

2.5 Monitors: Monitors shall be designed for continuous operation with 15k hrs.mtbf, quick starting, 120v, 60hz, furnished in metal cabinets. Monochrome horizontal resolution shall be 600 lines. Color horizontal resolution shall be 300 lines.

3.0 EXECUTION:

3.1 Installation: Interior installations shall comply with NFPA 70. Exterior installations shall comply with IEEE C2, NFPA 70, and NFPA 780. All system components shall be installed in accordance with the manufacturer's specifications and recommendations.

3.1.1 The headend equipment shall be aligned to meet System Performance and manufacturers requirements.

3.1.2 Components Amplifiers, equalization circuitry, splitters, and power supplies shall be located with the cable, suitably waterproofed and protected with a metal enclosure when mounted outside or in a secured area on a wooden backboard for indoor installations.

3.1.3 Towers shall be installed in accordance with the manufacturer's instructions. An inspection of all tower parts shall be made upon receipt. Any members which sustain damage either in shipment or construction shall be reported to the Contracting Officer immediately. Correction of damage shall not be done without approval from the Contracting Officer.

3.1.4 Antennas shall be installed in accordance with the manufacturers instructions. Exact antenna alignment to receive the maximum signal level and quality is the responsibility of the Contractor. Downlead cables from the antennas shall be supported in increments not more than three feet.

3.2 Grounding: shall be in accordance with applicable portions of NFPA 70, NFPA 780, IEEE C2, UL 467 and EIA ANSI/EIA/TIA-222-F. The maximum resistance to ground at the connection point for all system components shall be 25 ohms. The grounding conductors shall be as a minimum No. 6 AWG solid copper. Existing towers, if utilized, shall be made to conform to the above requirements. All system components shall have a direct connection to ground. Each cable at the point of building entry shall be grounded with a grounding block or be equipped with a surge protector to dissipate electrical surges. Grounding blocks shall be directly connected to a ground. All headend equipment shall be equipped with surge protection either by inherent design or external device. Unless otherwise specified, lightning and transient surge protection shall be provided in accordance with NFPA 780.



SECTION 16900 POLES FOR STREET AND AREA LIGHTING SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for poles for street and area lighting systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Wood Poles: Wood poles shall comply with ANSI O5.1. Poles shall be pressure treated in accordance with AWP A C4, with creosote conforming to AWP A P1/P13. Oil-borne preservatives and petroleum shall conform with AWP A P8 and AWP A P9, respectively. Waterborne preservatives shall conform with AWP A P5. Waterborne preservatives shall be either chromated or ammoniacal copper arsenate. Any species listed in ANSI O5.1 for which a preservative treatment is not specified in AWP A C4, shall not be used. Northern white cedar, if treated as specified for western red cedar, and western fir, if treated as specified for Douglas fir, may be used. Wood poles shall have pole markings located approximately 10 feet from pole butts for poles 50 feet or less in length, and 14 feet from the pole butts for poles longer than 55 feet in length. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Where poles are not provided with factory-cut gains, metal gain plates shall be provided.

2.2 Steel Poles: Steel poles shall be designed to withstand the loads specified in IEEE C2 multiplied by the appropriate overload capacity factors, shall be hot-dip galvanized in accordance with ASTM A 123. Poles shall have tapered tubular members, either round in cross-section or polygonal, and comply with strength calculations performed by a registered professional engineer. Calculations shall be submitted. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, length, and a loading tree. Attachment requirements shall be provided as indicated, including grounding provisions. Climbing facilities are not required. Bases shall be of the anchor-bolt-mounted type.

2.3 Concrete Poles: Concrete poles shall be designed to withstand the loads specified in IEEE C2 multiplied by the appropriate overload capacity factors. Poles shall be reinforced or prestressed, either cast or spun. Spun poles shall be manufactured by a centrifugal spinning process with concrete pumped into a polished round tapered metal mold. Concrete for spun poles shall have a compressive strength of at least 5000 psi at 28 days. Steel wire shall have an ultimate tensile strength of at least 120,000 psi; and reinforcing bars shall have an ultimate tensile strength of at least 40,000 psi. After the high speed spinning action is completed, a spun pole shall be cured by a suitable wet steam process. Spun poles shall have a water absorption of not greater than three percent to eliminate cracking and to prevent erosion. Concrete poles shall have hollow shafts. Poles shall have a hard, smooth, nonporous surface that is resistant to soil acids, road salts, and attacks of water and frost. Poles shall not be installed for at least 15 days after manufacture. Fittings and brackets that conform to the concrete pole design shall be provided. Poles shall conform to strength calculations performed by a registered professional engineer and submitted.

2.4 Steel, Aluminum, and Concrete Poles: ASTM A 500, ASTM B 209, and AASHTO Standards.

2.4 Aluminum Poles: shall be of high-strength aluminum having a yield strength of 34,000 psi.

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2.5 Painting: Materials shall match that of existing or adjacent pole finish.

3.0 EXECUTION:

3.1 Safety Precautions shall comply with applicable requirements of the National Electrical Safety Code.

3.2 Wood Pole Setting: In normal firm ground, minimum pole setting depths shall be as follows: for pole lengths of 20 feet, 25 feet, 30 feet, and 35 feet the minimum depth shall be 5 feet, 5 feet 6 inches, and 6 feet, respectively. For pole lengths up to 100 feet the minimum depth shall be 10 percent of length for both straight and curved lines, plus 2 feet for straight lines and 10 percent of length plus 2 feet 6 inches for curves and corners. In rocky or swampy ground, pole setting depths shall be respectively decreased or increased as required by local power company published standards and as approved by the Contracting Officer. In swampy ground, a bog shoe may be used.

3.3 Wood Pole Inspections:

3.3.1 Visually Inspect Standing Wood Poles for ground-line heart rot, aboveground heart rot, pole top heart rot, shell rot, mechanical damage, eroded foundations, large splits, and lightning damage.

3.3.2 Coat Surfaces with creosote-base wood preservative coating compound and wrap with impregnated felt bandage in compliance with wood pole preservative materials supplier's instructions.

3.4 Wood Pole Decay Maintenance:

3.4.1 Ground-Line Heart Rot shall be treated with an approved fumigant.

3.4.2 Wood Poles with surface decay below grade shall be replaced with new poles.

3.5 Concrete Repair: Repair spalling in pole foundations and concrete poles by thoroughly coating with 2,000 psi shear strength epoxy resin, applying 3,000 psi 28-day concrete, and finishing to restore original configuration of the concrete.

3.6 Steel Pole Maintenance: Steel poles that are corroded shall be chemically cleaned of rust and scale primed and painted.



Section 16916 Electrical Distribution System Substation Equipment

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of electrical distribution system substation equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The maintenance and repair work shall include but not be limited to the following major equipment:

- a. Power Transformers.
- b. Station Service Transformers.
- c. Automatic Tap Changing Transformers.
- d. Switchgear.
- e. Oil Circuit Breakers.
- f. Isolating Switches.
- g. Metering Equipment.
- h. Relaying Equipment.
- i. Station Battery System.
- j. Articulated Secondary Unit Substation.
- k. Integral Transformer-Load Center.

2.1 Power Distribution Panel: NEMA PB 1.

2.2 Insulating Oil, Electrical (For Transformers, Switches, and Circuit Breakers): ASTM D 923. ASTM D 4059.

2.3 Distribution, Power, and Regulating Transformers: ANSI 462 series as applicable.

2.4 Instrument Transformers: ANSI C57.13.

2.5 Installation and Maintenance of Oil-Immersed Transformers: ANSI/IEEE C57.12.00.

2.6 Voltage Air Switches, Bus Supports, and Switch Accessories: ANSI/IEEE C37.30, C37.34.

2.7 Low-Voltage AC Power Circuit Breakers: ANSI C37.50.

2.8 Electrical Analog Indicating Instruments: ANSI C39.1.

2.9 Primary Unit Substation: NEMA 201.

2.10 Secondary Unit Substation: NEMA 210.

2.11 Molded Case Circuit Breakers: NEMA AB1.

2.12 Watthour Meters: ANSI C12.10.

2.13 Switchboards, Dead Front Distribution: NEMA PB 2.

3.0 EXECUTION:

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3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.2 Protection: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Workmanship: Work shall be completed in accordance with NFPA 70 and NFPA 70B.

3.4 Interruptions: During interruptions, equipment and standby systems shall be provided to maintain existing electrical service.

3.5 Fences shall be checked for security. Gates and locks shall be checked for proper operation and grounding.

3.6 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest federal and state requirements.



SECTION 16917 ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR BANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system capacitor banks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Material: New capacitors shall comply with NEMA CP 1 and shall not use impregnant containing polychlorinated biphenyls (PCB).

3.0 EXECUTION:

3.1 Outages shall be scheduled and coordinated in advance with the Contracting Officer.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Maintenance and Repair Work: Workmen shall allow the capacitor time to discharge and then short capacitor terminals together and ground before touching any live parts. Capacitors shall be checked in accordance with NEMA CP 1 and NFPA 70. Perform the necessary preventative maintenance, repair, or replacement of any of the components.

3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.



SECTION 16925 HIGH-VOLTAGE DISCONNECTING DEVICES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Insulating Oil: ASTM standards applicable to the oil in use.

2.2 General Electrical: ANSI/IEEE C2.

2.3 Power Fuses and Fuse Disconnecting Switches: Incoming line power fuse disconnecting units, consisting of power fuses and fuse disconnecting switches, shall comply with NEMA SG 2. Expulsion-type or Current-limiting power disconnecting units and fuses shall have ratings in accordance with ANSI C37.46.

2.4 Automatic Circuit Reclosers For AC Systems: Automatic circuit reclosers shall comply with IEEE ANSI/IEEE C37.60 and shall be outdoor oil or vacuum type, complete with devices, attachments, and accessories required for installation and operation and shall be suitable for mounting on a single pole. Each recloser shall have continuous current, minimum tripping current, interrupting current, and making current ratings and reclosure times as indicated and shall be rated for the voltage and phase of the system in which it is installed. Three-phase lockout shall be provided on three-phase circuits. Reclosers shall include provisions for a sequence of not less than three automatic reclosing operations unless otherwise noted, followed by lockout if the circuit fault persists, and for manual opening, closing, and lockout by use of a hookstick. Operating sequence shall be adjustable for 1, 2, 3, and 4 operations to lockout and for combinations of instantaneous operations followed by time delay openings to secure coordination with other reclosers and fuses in the medium-voltage distribution system. Reclosers shall automatically reset within a definite time interval after a successful reclosure and shall be supplied with devices needed to provide the necessary operating power. Hydraulically-controlled reclosers shall be provided with tank drains and sampling valves. Surge arrester protection shall be provided.

2.5 Automatic Line Sectionalizers For AC Systems: Pole-mounted sectionalizing switches shall comply with IEEE ANSI/IEEE C37.63. Sectionalizers shall be coordinated with source side recloser as shown.

2.6 Power Switching Equipment: NEMA SG 3, SG 5, and SG 6.

2.7 Distribution Cutouts and Arrestor Combination Mounting: ANSI C37.42 and ANSI/IEEE C62.11.

3.0 EXECUTION:

3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.

3.2 Protection: Precaution, in compliance with ANSI/IEEE C2, shall be taken to prevent injury to personnel and to avoid damage to equipment and property.



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3.3 Oil Handling and Disposal: Oil and oil contaminated materials shall be handled and disposed of to comply with the latest federal and state regulations.

DIVISION 19 DEMOLITION

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SECTION 19120 DEMOLITION

1.0 DESCRIPTION OF WORK: This specification covers the dismantling, salvage, demolition, and disposal of designated structures, utilities, and/or materials as directed by the Contracting Officer.

2.0 PRODUCTS: (Not Used).

3.0 EXECUTION:

3.1 Submittals: Procedures proposed for the accomplishment of all demolition and salvage work, including a detailed description of the methods and equipment to be used for each operation and the scheduled sequence of operations, shall be submitted to the Contracting Officer for approval. Operations which involve interruption of utility services or the handling of toxic or hazardous materials shall be scheduled and approved by the Contracting Officer at least 48 hours prior to the start of such operations.

3.2 Clearances and Permits: Obtain as required from local authorities.

3.3 Salvage: Title to all materials and equipment to be demolished is vested in the Government. Unsalvageable materials shall be disposed of as directed by the Contracting Officer. Materials and equipment for Government salvage or reuse shall be carefully removed and delivered to a storage site designated by the Contracting Officer.

3.4 Protection of Existing Work: All necessary precautions shall be taken to ensure against damage to existing work that is to remain in place or is to remain the property of the Government. Damaged areas shall be repaired or replaced with new products to match existing surrounding surfaces. Shoring, bracing, and supports shall be provided as required and structural elements shall not be overloaded. Care shall be taken to prevent unscheduled interruptions to any utility service.

3.5 Protection From Weather: The interior of buildings and all materials and equipment shall be protected from the weather at all times.

3.6 Dust and Dirt Control: Dust and dirt resulting from demolition operations shall be controlled to prevent spread into occupied portions of buildings and to avoid creation of a nuisance to the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, and pollution.

3.7 Burning: Burning at the project site for the disposal of refuse and debris will not be permitted.

3.8 Explosives: The use of explosives will not be permitted.

3.9 Hazardous Materials: Extreme care and caution shall be exercised at all times when handling toxic or hazardous materials in order to prevent harm to personnel and property and to prevent environmental contamination. Federal and state regulations governing handling, transportation, and disposal of such materials shall be rigidly adhered to.



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3.10 Utilities: Temporary interruptions, disconnections, and relocation of existing utilities and removal of abandoned utility services shall be as directed by the Contracting Officer.

3.11 Cleanup: Debris and rubbish shall not be allowed to accumulate in buildings or on site. Local regulations regarding hauling and disposal shall be followed.

SPECIFICATION CROSS REFERENCE

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CROSS REFERENCE ORDERED BY UNIT PRICE BOOK SECTION

SECTION_U	SECTION_S	DESC
01418	02227	FIELD TESTS
02010	02012	STANDARD PENETRATION TESTS
02010	19120	DEMOLITION
02011	19120	DEMOLITION
02012	02012	STANDARD PENETRATION TESTS
02012	19120	DEMOLITION
02046	19120	DEMOLITION
02049	19120	DEMOLITION
02055	19120	DEMOLITION
02057	19120	DEMOLITION
02058	19120	DEMOLITION
02059	19120	DEMOLITION
02068	19120	DEMOLITION
02069	19120	DEMOLITION
02070	19120	DEMOLITION
02072	19120	DEMOLITION
02087	02080	ASBESTOS REMOVAL AND DISPOSAL
02109	02110	CLEARING AND GRUBBING
02215	02211	ROCK REMOVAL
02215	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02216	02222	STRUCTURAL EXCAVATION
02220	02220	SITE EXCAVATION AND FILL
02223	02220	SITE EXCAVATION AND FILL
02226	02220	SITE EXCAVATION AND FILL
02227	02220	SITE EXCAVATION AND FILL
02228	02211	ROCK REMOVAL
02228	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02230	02211	ROCK REMOVAL
02230	02220	SITE EXCAVATION AND FILL
02230	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02231	02220	SITE EXCAVATION AND FILL
02231	02227	FIELD TESTS
02235	02224	PIPE SLEEVES FOR UTILITY LINES
02240	02211	ROCK REMOVAL
02240	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02240	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02241	02243	SOIL STABILIZATION - HYDRATED LIME
02241	02921	TOPSOIL
02243	02250	SOIL STABILIZATION - VIBROFLOTATION
02243	02515	CRUSHED STONE PAVING
02244	02251	SOIL STERILIZATION
02244	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02250	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02250	02243	SOIL STABILIZATION - HYDRATED LIME
02250	02251	SOIL STERILIZATION
02250	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02250	02578	SPRAY APPLICATIONS, SEAL COATS



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02252	02250	SOIL STABILIZATION - VIBROFLOTATION
02266	02275	SOIL - CEMENT SURFACING
02266	02727	EROSION CONTROL
02267	02745	IMHOFF TANKS
02270	02272	GABIONS
02270	02274	RIPRAP
02368	14570	.NULL.
02422	02450	RAILROADS
02511	02512	STEEL REINFORCED PORTLAND CEMENT
02511	02513	FIBROUS REINFORCED PORTLAND CEMENT
02511	02710	FOUNDATION DRAINAGE SYSTEMS
02512	02712	UNDERSLAB DRAINAGE
02514	02520	PORTLAND CEMENT CONCRETE SIDEWALKS
02514	02521	ASPHALT CONCRETE SIDEWALKS
02514	02522	MISCELLANEOUS SIDEWALKS
02514	02523	PRECAST SIDEWALKS AND PAVERS
02517	15576	BREECHING
02525	02525	CONCRETE CURBS AND GUTTERS
02530	14570	.NULL.
02531	02725	SAND DRAINS
02531	02860	PLAYING FIELDS
02545	02745	IMHOFF TANKS
02546	02514	ASPHALTIC CONCRETE OVERLAYS
02546	02570	PORTLAND CEMENT CONCRETE
02546	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02546	02576	CRACK SEALING OF ASPHALT CONCRETE PAVEME
02546	02577	PATCHING OF ASPHALT CONCRETE PAVEMENTS
02546	02579	SLURRY SEALS
02580	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02580	02590	PAVEMENT MARKINGS
02580	02670	WELL REPAIR
02644	02661	WATER LINES
02645	15100	VALVES
02658	02661	WATER LINES
02661	02724	FORCE MAINS AND INVERTED SIPHONS
02663	02666	CHILLED WATER LINES
02663	15262	INSULATION FOR UNDERGROUND PIPE
02664	02661	WATER LINES
02667	02710	FOUNDATION DRAINAGE SYSTEMS
02674	02672	WATER WELLS
02684	02685	GAS DISTRIBUTION LINES
02688	02685	GAS DISTRIBUTION LINES
02704	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02704	02243	SOIL STABILIZATION - HYDRATED LIME
02704	02250	SOIL STABILIZATION - VIBROFLOTATION
02704	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02704	02710	FOUNDATION DRAINAGE SYSTEMS
02704	02712	UNDERSLAB DRAINAGE
02709	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02710	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02710	02830	FENCES AND GATES
02710	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02712	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02712	02832	STEEL ROD AND BAR FENCING

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



02712	02833	WROUGHT IRON ROD AND BAR FENCING
02712	02837	FARM-TYPE WIRE FENCING
02752	02720	STORM DRAINS
02752	02725	SAND DRAINS
02752	02726	WASTEWATER COLLECTION
02752	02730	SEWER LINE MANHOLES
02752	02740	SEPTIC TANKS AND GREASE TRAPS
02752	02766	SEWER LINE PIPE LINING
02762	02661	WATER LINES
02764	02720	STORM DRAINS
02766	02710	FOUNDATION DRAINAGE SYSTEMS
02768	15060	MECHANICAL PIPING
02772	02710	FOUNDATION DRAINAGE SYSTEMS
02776	02742	SIPHON TANK AND SIPHONS
02831	02831	STEEL CHAIN-LINK FENCING
02834	02832	STEEL ROD AND BAR FENCING
02834	02833	WROUGHT IRON ROD AND BAR FENCING
02834	02837	FARM-TYPE WIRE FENCING
02836	02830	FENCES AND GATES
02836	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02836	02835	PERMANENT WOOD FENCING
02840	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02841	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02841	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02842	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02842	02850	TRAFFIC SIGNS
02863	02861	RECREATIONAL FACILITIES
02911	02950	PLANTINGS
02932	02933	SODDING AND SEEDING
02933	02933	SODDING AND SEEDING
03114	03105	CONCRETE FORMWORK
03116	03105	CONCRETE FORMWORK
03118	03105	CONCRETE FORMWORK
03126	03105	CONCRETE FORMWORK
03132	03130	CONCRETE ACCESSORIES
03133	03130	CONCRETE ACCESSORIES
03138	03105	CONCRETE FORMWORK
03142	03105	CONCRETE FORMWORK
03146	03105	CONCRETE FORMWORK
03150	03105	CONCRETE FORMWORK
03154	03105	CONCRETE FORMWORK
03158	03105	CONCRETE FORMWORK
03162	03105	CONCRETE FORMWORK
03170	03105	CONCRETE FORMWORK
03174	03105	CONCRETE FORMWORK
03182	03105	CONCRETE FORMWORK
03196	03105	CONCRETE FORMWORK
03198	03130	CONCRETE ACCESSORIES
03217	03205	CONCRETE REINFORCEMENT
03219	03205	CONCRETE REINFORCEMENT
03227	03205	CONCRETE REINFORCEMENT
03227	03227	STEEL STRESSING TENDONS FOR PRESTRESSED
03228	03205	CONCRETE REINFORCEMENT



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03311	03305	CAST-IN-PLACE CONCRETE
03314	03305	CAST-IN-PLACE CONCRETE
03318	03305	CAST-IN-PLACE CONCRETE
03326	03305	CAST-IN-PLACE CONCRETE
03334	03334	CONCRETE CURING
03356	03356	GROUT
03362	03362	SHOTCRETE
03368	03705	CONCRETE RESTORATION AND CLEANING
03372	03372	SPECIALLY PLACED CONCRETE
03396	03305	CAST-IN-PLACE CONCRETE
03396	03730	CONCRETE TOPPING
03398	03305	CAST-IN-PLACE CONCRETE
03399	03399	ROLLER-COMPACTED CONCRETE
03404	03415	PRECAST-PRESTRESSED CONCRETE
03411	03405	PRECAST ARCHITECTURAL CONCRETE
03411	03415	PRECAST-PRESTRESSED CONCRETE
03412	03415	PRECAST-PRESTRESSED CONCRETE
03414	03405	PRECAST ARCHITECTURAL CONCRETE
03414	03415	PRECAST-PRESTRESSED CONCRETE
03414	03425	MISCELLANEOUS PRECAST ITEMS
03436	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03440	03415	PRECAST-PRESTRESSED CONCRETE
03454	03405	PRECAST ARCHITECTURAL CONCRETE
03455	03415	PRECAST-PRESTRESSED CONCRETE
03474	03405	PRECAST ARCHITECTURAL CONCRETE
03474	03415	PRECAST-PRESTRESSED CONCRETE
03482	03415	PRECAST-PRESTRESSED CONCRETE
03490	03405	PRECAST ARCHITECTURAL CONCRETE
03490	03415	PRECAST-PRESTRESSED CONCRETE
03490	03425	MISCELLANEOUS PRECAST ITEMS
03491	03415	PRECAST-PRESTRESSED CONCRETE
03510	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03510	03510	GYP SUM CONCRETE DECKS
03510	03530	CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEM
03520	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03522	03415	PRECAST-PRESTRESSED CONCRETE
03524	03415	PRECAST-PRESTRESSED CONCRETE
03526	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03536	03530	CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEM
03720	03705	CONCRETE RESTORATION AND CLEANING
03730	03705	CONCRETE RESTORATION AND CLEANING
03740	03730	CONCRETE TOPPING
04110	04202	UNIT MASONRY
04110	04210	BRICKWORK
04110	04250	TERRA COTTA
04116	04202	UNIT MASONRY
04116	04210	BRICKWORK
04116	04250	TERRA COTTA
04150	04150	.NULL.
04150	04210	BRICKWORK
04150	04405	STONWORK
04150	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
04190	04190	SCAFFOLDING - TUBULAR STEEL
04210	04202	UNIT MASONRY

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04210	04210	BRICKWORK
04220	04202	UNIT MASONRY
04225	04210	BRICKWORK
04225	15576	BREECHING
04227	15576	BREECHING
04232	04202	UNIT MASONRY
04235	04202	UNIT MASONRY
04237	04202	UNIT MASONRY
04240	04202	UNIT MASONRY
04240	04250	TERRA COTTA
04245	04202	UNIT MASONRY
04248	04202	UNIT MASONRY
04251	04202	UNIT MASONRY
04251	04250	TERRA COTTA
04253	04202	UNIT MASONRY
04255	04202	UNIT MASONRY
04259	04210	BRICKWORK
04260	15576	BREECHING
04270	04202	UNIT MASONRY
04411	04405	STONework
04422	04405	STONework
04423	04405	STONework
04424	04405	STONework
04426	04405	STONework
04429	04510	MASONRY RESTORATION
04450	04405	STONework
04510	04510	MASONRY RESTORATION
04520	04210	BRICKWORK
04520	04510	MASONRY RESTORATION
04550	04202	UNIT MASONRY
04554	15576	BREECHING
05008	14570	.NULL.
05020	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05060	14570	.NULL.
05075	05120	STRUCTURAL STEEL
05075	14570	.NULL.
05108	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05120	05120	STRUCTURAL STEEL
05120	05518	PIPE AND TUBE RAILINGS
05120	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05120	14570	.NULL.
05125	05120	STRUCTURAL STEEL
05130	05120	STRUCTURAL STEEL
05130	05130	STEEL DECK
05130	05530	GRATING
05130	14570	.NULL.
05130	15120	PIPING ACCESSORIES
05132	05120	STRUCTURAL STEEL
05134	05120	STRUCTURAL STEEL
05134	05130	STEEL DECK
05134	14570	.NULL.
05140	05120	STRUCTURAL STEEL
05150	05120	STRUCTURAL STEEL



Job Order Contract Specifications

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05150	14570	.NULL.
05155	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05155	05120	STRUCTURAL STEEL
05155	05155	STEEL JOISTS
05155	05210	STEEL TRUSSES
05155	09941	PAINTING OF WATER STORAGE TANK
05155	14570	.NULL.
05175	14570	.NULL.
05178	05556	ORNAMENTAL SHEET METAL
05180	05180	MISCELLANEOUS STANDARD METAL ARTICLES
05210	05155	STEEL JOISTS
05210	05210	STEEL TRUSSES
05314	05130	STEEL DECK
05511	05520	METAL STAIRS
05512	05520	METAL STAIRS
05518	05518	PIPE AND TUBE RAILINGS
05520	05520	METAL STAIRS
05520	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05528	05520	METAL STAIRS
05528	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05528	05556	ORNAMENTAL SHEET METAL
05534	05530	GRATING
05542	05530	GRATING
05546	05530	GRATING
05547	05540	CASTINGS
05556	05556	ORNAMENTAL SHEET METAL
05560	05180	MISCELLANEOUS STANDARD METAL ARTICLES
05561	05556	ORNAMENTAL SHEET METAL
05814	05814	EXPANSION JOINT COVERS
05911	05910	WATER TREATMENT PLANT DEBRIS RACKS
05912	05910	WATER TREATMENT PLANT DEBRIS RACKS
05913	05910	WATER TREATMENT PLANT DEBRIS RACKS
05914	05910	WATER TREATMENT PLANT DEBRIS RACKS
05915	05910	WATER TREATMENT PLANT DEBRIS RACKS
06056	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
06056	06056	TIMBER BRIDGE COMPONENTS
06056	06116	LIGHT WOODEN STRUCTURES FRAMING
06056	06181	WOOD TRUSSES
06103	06116	LIGHT WOODEN STRUCTURES FRAMING
06116	06116	LIGHT WOODEN STRUCTURES FRAMING
06116	06181	WOOD TRUSSES
06128	06116	LIGHT WOODEN STRUCTURES FRAMING
06140	06140	SHEATHING, SIDING, AND SUBFLOORING
06154	06140	SHEATHING, SIDING, AND SUBFLOORING
06164	06140	SHEATHING, SIDING, AND SUBFLOORING
06168	06140	SHEATHING, SIDING, AND SUBFLOORING
06181	06181	WOOD TRUSSES
06182	06140	SHEATHING, SIDING, AND SUBFLOORING
06190	06116	LIGHT WOODEN STRUCTURES FRAMING
06190	06181	WOOD TRUSSES
06222	06220	MILLWORK
06226	06220	MILLWORK
06227	06220	MILLWORK
06230	06220	MILLWORK

Job Order Contract Specifications

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06240	06240	CABINETS
06251	06250	WOOD PANELING
06255	06250	WOOD PANELING
06312	06116	LIGHT WOODEN STRUCTURES FRAMING
06402	06240	CABINETS
06438	06220	MILLWORK
06514	06514	.NULL.
06518	06610	.NULL.
06610	06610	.NULL.
07110	07115	PLASTIC SHEET WATERPROOFING
07112	07111	BITUMINOUS MEMBRANE WATERPROOFING
07112	07115	PLASTIC SHEET WATERPROOFING
07112	07198	PLASTIC SHEET VAPOR BARRIERS
07114	07120	FLUID-APPLIED WATERPROOFING
07115	07110	BITUMINOUS WATERPROOFING
07115	07111	BITUMINOUS MEMBRANE WATERPROOFING
07120	07120	FLUID-APPLIED WATERPROOFING
07131	07130	BENTONITE CLAY WATERPROOFING
07146	07125	METAL WATERPROOFING
07162	07160	BITUMINOUS DAMPPROOFING
07174	07170	SILICONE DAMPPROOFING
07182	07180	CEMENTITIOUS DAMPPROOFING
07202	07211	LOOSE OR GRANULAR FILL INSULATION
07210	07210	BATT AND BLANKET BUILDING INSULATION
07210	07211	LOOSE OR GRANULAR FILL INSULATION
07210	07212	RIGID INSULATION
07215	07215	SPRAYED-ON INSULATION
07216	07212	RIGID INSULATION
07218	07210	BATT AND BLANKET BUILDING INSULATION
07218	07211	LOOSE OR GRANULAR FILL INSULATION
07218	07212	RIGID INSULATION
07223	07213	PERIMETER INSULATION
07223	07223	ROOF INSULATION AND UNDERLAYMENT
07223	07224	ROOF INSULATION AND UNDERLAYMENT
07223	07225	ROOF INSULATION AND UNDERLAYMENT
07223	07226	ROOF INSULATION AND UNDERLAYMENT
07223	07227	ROOF INSULATION AND UNDERLAYMENT
07240	07223	ROOF INSULATION AND UNDERLAYMENT
07240	07224	ROOF INSULATION AND UNDERLAYMENT
07240	07225	ROOF INSULATION AND UNDERLAYMENT
07240	07226	ROOF INSULATION AND UNDERLAYMENT
07240	07227	ROOF INSULATION AND UNDERLAYMENT
07242	07210	BATT AND BLANKET BUILDING INSULATION
07254	07256	SPRAYED-ON FIREPROOFING
07314	07314	SLATE SHINGLES
07322	07321	CLAY ROOFING TILES
07411	07410	PREFORMED ROOFING AND SIDING
07411	07605	SHEET METAL
07424	07410	PREFORMED ROOFING AND SIDING
07511	07463	ASBESTOS CEMENT ROOFING AND SIDING
07511	07510	BUILT-UP ROOFING
07511	07530	SINGLE PLY ROOFING
07511	07573	COMPOSITION TRAFFIC TOPPING



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07512	07550	INVERTED ROOF SYSTEMS
07515	07510	BUILT-UP ROOFING
07531	07530	SINGLE PLY ROOFING
07621	07605	SHEET METAL
07622	07605	SHEET METAL
07624	07605	SHEET METAL
07624	15120	PIPING ACCESSORIES
07625	07605	SHEET METAL
07717	07605	SHEET METAL
07726	07705	ROOF ACCESSORIES
07729	07605	SHEET METAL
07811	07811	PLASTIC SKYLIGHTS
07822	07812	METAL-FRAMED SKYLIGHTS
07924	07920	SEALANTS
08109	08110	HOLLOW METAL DOORS AND FRAMES
08114	08110	HOLLOW METAL DOORS AND FRAMES
08115	08110	HOLLOW METAL DOORS AND FRAMES
08115	08115	ALUMINUM DOORS AND FRAMES
08116	08110	HOLLOW METAL DOORS AND FRAMES
08118	08110	HOLLOW METAL DOORS AND FRAMES
08119	08110	HOLLOW METAL DOORS AND FRAMES
08220	08220	WOOD DOORS AND FRAMES
08254	08220	WOOD DOORS AND FRAMES
08262	08220	WOOD DOORS AND FRAMES
08266	08220	WOOD DOORS AND FRAMES
08270	08220	WOOD DOORS AND FRAMES
08278	08220	WOOD DOORS AND FRAMES
08278	08278	.NULL.
08278	08379	WOOD SAFETY GLASS DOORS
08278	08390	SCREEN AND STORM DOORS
08278	08800	GLASS AND GLAZING
08279	08220	WOOD DOORS AND FRAMES
08305	08110	HOLLOW METAL DOORS AND FRAMES
08312	08312	ALUMINUM AND WOOD SLIDING GLASS DOORS
08316	08316	SLIDING FIRE DOORS
08317	08317	SECURITY VAULT DOORS
08332	08330	COILING (ROLLING) DOORS
08342	08330	COILING (ROLLING) DOORS
08356	08356	FLEXIBLE DOORS
08361	08360	OVERHEAD DOORS
08362	08360	OVERHEAD DOORS
08365	08360	OVERHEAD DOORS
08369	08330	COILING (ROLLING) DOORS
08372	15834	.NULL.
08372	15865	AXIAL FLOW FANS
08376	08330	COILING (ROLLING) DOORS
08379	08379	WOOD SAFETY GLASS DOORS
08385	08385	SOUND RETARDANT DOORS
08390	08390	SCREEN AND STORM DOORS
08394	08390	SCREEN AND STORM DOORS
08413	08410	ENTRANCES
08415	08410	ENTRANCES
08415	08915	ALUMINUM WINDOW WALLS/CURTAIN WALLS
08417	08410	ENTRANCES

Job Order Contract Specifications

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08471	08471	REVOLVING DOORS
08512	08512	METAL WINDOWS
08520	08520	ALUMINUM WINDOWS
08524	08520	ALUMINUM WINDOWS
08604	08610	WOOD WINDOWS
08610	08610	WOOD WINDOWS
08620	08610	WOOD WINDOWS
08624	08610	WOOD WINDOWS
08632	08610	WOOD WINDOWS
08640	08610	WOOD WINDOWS
08704	08710	FINISH HARDWARE
08708	08710	FINISH HARDWARE
08709	08710	FINISH HARDWARE
08710	08710	FINISH HARDWARE
08713	08710	FINISH HARDWARE
08714	08710	FINISH HARDWARE
08715	08710	FINISH HARDWARE
08716	08710	FINISH HARDWARE
08717	08710	FINISH HARDWARE
08718	08710	FINISH HARDWARE
08719	08710	FINISH HARDWARE
08726	08710	FINISH HARDWARE
08728	08710	FINISH HARDWARE
08729	08710	FINISH HARDWARE
08734	08710	FINISH HARDWARE
08754	08710	FINISH HARDWARE
08755	08800	GLASS AND GLAZING
08818	08800	GLASS AND GLAZING
08820	08800	GLASS AND GLAZING
08832	08800	GLASS AND GLAZING
08836	08800	GLASS AND GLAZING
08844	08800	GLASS AND GLAZING
08852	08800	GLASS AND GLAZING
08855	08800	GLASS AND GLAZING
08862	08800	GLASS AND GLAZING
08872	08800	GLASS AND GLAZING
08876	08800	GLASS AND GLAZING
08884	08800	GLASS AND GLAZING
08894	08800	GLASS AND GLAZING
08895	08800	GLASS AND GLAZING
08924	08915	ALUMINUM WINDOW WALLS/CURTAIN WALLS
09134	09210	PLASTER REPAIRS
09134	09510	ACOUSTICAL CEILINGS
09200	09210	PLASTER REPAIRS
09203	09210	PLASTER REPAIRS
09211	09210	PLASTER REPAIRS
09213	09210	PLASTER REPAIRS
09263	09210	PLASTER REPAIRS
09312	09315	TILE FLOORING
09312	09320	CERAMIC WALL TILE
09334	09315	TILE FLOORING
09340	09315	TILE FLOORING
09400	09405	TERRAZZO



Job Order Contract Specifications

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09414	09405	TERRAZZO
09421	09405	TERRAZZO
09510	09510	ACOUSTICAL CEILINGS
09512	09510	ACOUSTICAL CEILINGS
09514	09510	ACOUSTICAL CEILINGS
09519	09510	ACOUSTICAL CEILINGS
09526	09535	SOUND ABSORBING PANELS
09534	09530	ACOUSTICAL INSULATION AND BARRIERS
09564	09560	WOOD STRIP FLOORING
09564	09570	WOOD PARQUET FLOORING
09564	09596	GYMNASIUM FLOORING
09565	09566	WOOD BLOCK INDUSTRIAL FLOORING
09634	09750	BRICK FLOORING
09634	09751	LIGHT-DUTY BRICK FLOORING
09661	09655	RESILIENT FLOORING
09661	09675	CONDUCTIVE VINYL TILE FLOORING
09664	09651	RESILIENT FLOORING - CEMENTITIOUS UNDERL
09682	09685	CARPETING
09691	09685	CARPETING
09721	09405	TERRAZZO
09721	09670	FLUID-APPLIED RESILIENT FLOORING
09721	09720	EPOXY FLOORING
09721	09731	CONDUCTIVE ELASTOMERIC LIQUID FLOORING
09910	09910	EXTERIOR PAINTING
09920	09920	INTERIOR PAINTING
09960	09952	WALL COVERINGS
09970	09952	WALL COVERINGS
10050	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10050	10630	MOVABLE METAL PARTITIONS
10050	16610	LUMINAIRES
10160	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10183	08710	FINISH HARDWARE
10183	10550	POSTAL SPECIALTIES
10185	04202	UNIT MASONRY
10185	09405	TERRAZZO
10185	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10186	15401	INTERIOR PLUMBING
10214	05556	ORNAMENTAL SHEET METAL
10260	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
10260	10605	WIRE MESH PARTITIONS
10266	09952	WALL COVERINGS
10275	05528	ORNAMENTAL HANDRAIL AND RAILINGS
10275	10275	ACCESS AND PEDESTAL FLOORS
10350	07620	.NULL.
10350	10350	.NULL.
10350	10351	FLAGPOLES
10355	07620	.NULL.
10355	07920	SEALANTS
10355	10351	FLAGPOLES
10410	10410	DIRECTORY AND BULLETIN BOARDS
10410	10412	.NULL.
10430	10430	SIGNS
10451	10451	.NULL.
10451	10452	SECURITY SCREENS

Job Order Contract Specifications

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10505	10505	METAL LOCKERS
10505	10605	WIRE MESH PARTITIONS
10520	10520	FIRE EXTINGUISHERS, CABINETS, AND ACCESS
10521	15301	FIRE PROTECTION SYSTEMS
10522	15301	FIRE PROTECTION SYSTEMS
10535	08512	METAL WINDOWS
10535	08520	ALUMINUM WINDOWS
10551	10550	POSTAL SPECIALTIES
10553	10550	POSTAL SPECIALTIES
10605	08710	FINISH HARDWARE
10605	10605	WIRE MESH PARTITIONS
10615	08710	FINISH HARDWARE
10615	10615	DEMOUNTABLE PARTITIONS
10630	10630	MOVABLE METAL PARTITIONS
10677	10677	METAL STORAGE SHELVING
10820	10820	TOILET ACCESSORIES
10911	10911	WARDROBES
11024	05530	GRATING
11024	05556	ORNAMENTAL SHEET METAL
11024	11024	VAULT DOOR UNITS
11024	13800	FLOOR SAFES
11061	11061	THEATER & STAGE EQUIPMENT
11106	11106	REFRIGERATORS
11106	11402	FOOD SERVICE EQUIPMENT
11132	11132	PROJECTION SCREENS
11140	11501	PAINT SPRAY BOOTH
11140	15060	MECHANICAL PIPING
11140	15160	PUMPS
11150	11150	PARKING CONTROL EQUIPMENT
11161	11160	PLATFORM AND DOCK LIFTS
11161	11161	PLATFORM AND DOCK LEVELERS
11161	11165	PLATFORM AND DOCK BUMPERS
11169	10677	METAL STORAGE SHELVING
11402	11402	FOOD SERVICE EQUIPMENT
11402	15100	VALVES
11415	11415	UNIT KITCHENS
11420	11402	FOOD SERVICE EQUIPMENT
11420	11420	RANGES AND OVENS
11474	15401	INTERIOR PLUMBING
11474	15800	HUMIDITY CONTROL EQUIPMENT
11475	15401	INTERIOR PLUMBING
11484	11484	GYMNASIUM EQUIPMENT
11484	11486	DEMOUNTABLE BLEACHERS (EXTERIOR)
11600	11600	METAL MEDICAL CASEWORK
11600	11700	LABORATORY AND MEDICAL EQUIPMENT
11700	11600	METAL MEDICAL CASEWORK
11700	11700	LABORATORY AND MEDICAL EQUIPMENT
11910	11106	REFRIGERATORS
11910	11402	FOOD SERVICE EQUIPMENT
11910	11415	UNIT KITCHENS
11910	11420	RANGES AND OVENS
11910	11910	DISHWASHERS
11910	11912	GARBAGE DISPOSERS



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

11920	11920	CLOTHES DRYERS
11920	11922	CLOTHES WASHERS
11930	16830	ELECTRIC UNIT HEATERS
11940	05518	PIPE AND TUBE RAILINGS
11940	05520	METAL STAIRS
11940	06220	MILLWORK
11980	11980	TARGET FIRING RANGES (EXTERIOR)
12531	12531	WINDOW TREATMENT HARDWARE
13090	13090	RADIATION PROTECTION
13093	15890	DUCTWORK AND ACCESSORIES
13112	07210	BATT AND BLANKET BUILDING INSULATION
13112	13112	PRE-ENGINEERED STRUCTURES
13153	13151	.NULL.
13154	15475	POOL EQUIPMENT
13155	15475	POOL EQUIPMENT
13156	02710	FOUNDATION DRAINAGE SYSTEMS
13156	02717	.NULL.
13156	15475	POOL EQUIPMENT
13158	15475	POOL EQUIPMENT
13205	02665	WATER RESERVOIRS AND TANKS
13205	02665	WATER RESERVOIRS AND TANKS
13205	15451	STEEL TANKS
13205	15451	STEEL TANKS
13205	15452	PLASTIC TANKS
13205	15452	PLASTIC TANKS
13205	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
13210	02665	WATER RESERVOIRS AND TANKS
13210	02665	WATER RESERVOIRS AND TANKS
13210	15451	STEEL TANKS
13210	15452	PLASTIC TANKS
13210	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
13214	15451	STEEL TANKS
13214	15452	PLASTIC TANKS
13215	15451	STEEL TANKS
13215	15581	GAS METERS AND REGULATORS
13215	15590	FUEL HANDLING SYSTEMS
13215	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
13219	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
13800	13800	FLOOR SAFES
14211	14245	.NULL.
14211	14250	.NULL.
14211	14420	.NULL.
14400	14400	.NULL.
14401	14410	.NULL.
14405	14400	.NULL.
14416	14450	.NULL.
14551	14510	.NULL.
14611	14602	.NULL.
14611	14650	ASH HOISTS
14660	14602	.NULL.
15103	15100	VALVES
15104	15100	VALVES
15104	15401	INTERIOR PLUMBING
15107	15401	INTERIOR PLUMBING

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15109	15100	VALVES
15109	15401	INTERIOR PLUMBING
15111	15100	VALVES
15112	15100	VALVES
15114	15120	PIPING ACCESSORIES
15115	15100	VALVES
15115	15120	PIPING ACCESSORIES
15116	15100	VALVES
15116	15401	INTERIOR PLUMBING
15118	15100	VALVES
15121	15100	VALVES
15123	15100	VALVES
15141	14570	.NULL.
15141	15060	MECHANICAL PIPING
15141	15160	PUMPS
15142	15160	PUMPS
15143	15160	PUMPS
15145	15160	PUMPS
15146	15160	PUMPS
15149	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15151	15060	MECHANICAL PIPING
15151	15160	PUMPS
15152	15481	COMPRESSED AIR EQUIPMENT
15162	14570	.NULL.
15162	15060	MECHANICAL PIPING
15162	15120	PIPING ACCESSORIES
15164	15120	PIPING ACCESSORIES
15172	14570	.NULL.
15172	15060	MECHANICAL PIPING
15172	15120	PIPING ACCESSORIES
15174	15120	PIPING ACCESSORIES
15176	15120	PIPING ACCESSORIES
15176	15451	STEEL TANKS
15182	15261	INSULATION FOR ABOVEGROUND PIPE
15188	15060	MECHANICAL PIPING
15188	15261	INSULATION FOR ABOVEGROUND PIPE
15188	15262	INSULATION FOR UNDERGROUND PIPE
15190	15290	DUCTWORK INSULATION
15192	15060	MECHANICAL PIPING
15192	15100	VALVES
15193	15060	MECHANICAL PIPING
15193	15100	VALVES
15194	15060	MECHANICAL PIPING
15194	15100	VALVES
15197	15100	VALVES
15199	14570	.NULL.
15199	15100	VALVES
15220	15401	INTERIOR PLUMBING
15228	02744	GREASE INTERCEPTORS
15286	14570	.NULL.
15286	15160	PUMPS
15287	15610	WARM AIR FURNACES
15290	15160	PUMPS



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15291	15160	PUMPS
15292	15160	PUMPS
15293	15160	PUMPS
15295	15160	PUMPS
15297	15160	PUMPS
15298	15160	PUMPS
15306	15401	INTERIOR PLUMBING
15310	15401	INTERIOR PLUMBING
15411	15301	FIRE PROTECTION SYSTEMS
15414	15301	FIRE PROTECTION SYSTEMS
15416	15301	FIRE PROTECTION SYSTEMS
15417	15301	FIRE PROTECTION SYSTEMS
15418	15301	FIRE PROTECTION SYSTEMS
15508	15120	PIPING ACCESSORIES
15508	15301	FIRE PROTECTION SYSTEMS
15509	15558	HIGH TEMPERATURE WATER BOILERS
15509	15559	CAST-IRON BOILERS AND FIREBOXES
15510	15120	PIPING ACCESSORIES
15510	15558	HIGH TEMPERATURE WATER BOILERS
15511	15556	FIRE TUBE BOILERS
15513	15557	WATER TUBE BOILERS
15513	15558	HIGH TEMPERATURE WATER BOILERS
15541	15751	COILS
15542	15610	WARM AIR FURNACES
15542	15840	INDUCTION UNITS
15544	15680	REFRIGERANT EQUIPMENT
15547	15781	PACKAGED HEATING AND COOLING UNITS
15549	15760	STEAM AND HOT WATER UNIT HEATERS
15560	15301	FIRE PROTECTION SYSTEMS
15565	15830	RADIATORS
15566	15800	HUMIDITY CONTROL EQUIPMENT
15567	15261	INSULATION FOR ABOVEGROUND PIPE
15567	15290	DUCTWORK INSULATION
15567	15890	DUCTWORK AND ACCESSORIES
15568	15573	DRAFT CONTROL EQUIPMENT
15569	15576	BREECHING
15569	15577	STACKS
15601	15401	INTERIOR PLUMBING
15605	15590	FUEL HANDLING SYSTEMS
15622	15100	VALVES
15622	15556	FIRE TUBE BOILERS
15635	15120	PIPING ACCESSORIES
15635	15683	REFRIGERATION SPECIALTIES
15635	15887	TAILPIPE EXHAUST EQUIPMENT
15640	15100	VALVES
15640	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15672	15120	PIPING ACCESSORIES
15672	15680	REFRIGERANT EQUIPMENT
15680	15711	NATURAL DRAFT COOLING TOWERS
15680	15712	FORCED DRAFT AND INDUCED DRAFT COOLING T
15690	15680	REFRIGERANT EQUIPMENT
15698	15120	PIPING ACCESSORIES
15708	15855	AIR HANDLING UNITS
15710	15781	PACKAGED HEATING AND COOLING UNITS

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15713	15782	PACKAGED HEAT PUMPS
15717	15781	PACKAGED HEATING AND COOLING UNITS
15720	15610	WARM AIR FURNACES
15720	15680	REFRIGERANT EQUIPMENT
15721	15781	PACKAGED HEATING AND COOLING UNITS
15723	15751	COILS
15726	15481	COMPRESSED AIR EQUIPMENT
15728	15670	CONDENSERS
15729	15680	REFRIGERANT EQUIPMENT
15730	15711	NATURAL DRAFT COOLING TOWERS
15730	15712	FORCED DRAFT AND INDUCED DRAFT COOLING T
15731	15401	INTERIOR PLUMBING
15733	15860	CENTRIFUGAL FANS
15733	15865	AXIAL FLOW FANS
15733	15871	POWER ROOF VENTILATORS
15740	15886	AIR CLEANING DEVICES
15742	14570	.NULL.
15742	15100	VALVES
15742	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15747	15881	DIFFUSERS, REGISTERS, GRILLES, AND LOUVE
15749	15881	DIFFUSERS, REGISTERS, GRILLES, AND LOUVE
15750	15751	COILS
15751	15890	DUCTWORK AND ACCESSORIES
15751	15915	CONTROL AND FIRE DAMPERS
15751	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15752	15830	RADIATORS
15754	07705	ROOF ACCESSORIES
15754	15871	POWER ROOF VENTILATORS
15761	15990	TESTING AND BALANCING OF HVAC SYSTEMS
15763	15855	AIR HANDLING UNITS
15764	15886	AIR CLEANING DEVICES
15770	15683	REFRIGERATION SPECIALTIES
15890	15920	SOUND ATTENUATORS
16011	16032	WIRING SYSTEMS EQUIPMENT
16015	16032	WIRING SYSTEMS EQUIPMENT
16017	16032	WIRING SYSTEMS EQUIPMENT
16018	16032	WIRING SYSTEMS EQUIPMENT
16022	16032	WIRING SYSTEMS EQUIPMENT
16024	16032	WIRING SYSTEMS EQUIPMENT
16026	16032	WIRING SYSTEMS EQUIPMENT
16029	16032	WIRING SYSTEMS EQUIPMENT
16032	16032	WIRING SYSTEMS EQUIPMENT
16056	16032	WIRING SYSTEMS EQUIPMENT
16109	16032	WIRING SYSTEMS EQUIPMENT
16111	16111	FIBER OPTIC DATA TRANSMISSION SYSTEM
16113	16032	WIRING SYSTEMS EQUIPMENT
16114	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16114	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16115	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16115	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16117	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16117	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16119	16032	WIRING SYSTEMS EQUIPMENT



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16119	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16120	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16121	16032	WIRING SYSTEMS EQUIPMENT
16121	16121	INSTITUTIONAL ELECTRIC HEATING EQUIPMENT
16121	16825	FIRE ALARM AND DETECTION EQUIPMENT
16122	16032	WIRING SYSTEMS EQUIPMENT
16122	16814	TELEPHONE SYSTEM, OUTSIDE PLANT
16123	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16123	16123	ELECTRICAL DISTRIBUTION SYSTEM GROUNDING
16153	16032	WIRING SYSTEMS EQUIPMENT
16153	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16153	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16181	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16181	16123	ELECTRICAL DISTRIBUTION SYSTEM GROUNDING
16211	16032	WIRING SYSTEMS EQUIPMENT
16213	16032	WIRING SYSTEMS EQUIPMENT
16232	16032	WIRING SYSTEMS EQUIPMENT
16233	16032	WIRING SYSTEMS EQUIPMENT
16233	16233	CLOCK AND PROGRAM SYSTEMS
16234	16032	WIRING SYSTEMS EQUIPMENT
16313	16313	ELECTRIC MOTORS
16315	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16316	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16323	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16324	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16325	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16326	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16328	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16329	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16331	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16332	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16333	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16336	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16337	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16338	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16339	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16340	16925	HIGH-VOLTAGE DISCONNECTING DEVICES
16353	16313	ELECTRIC MOTORS
16412	16416	TRANSFORMERS
16416	16416	TRANSFORMERS
16423	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16424	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16427	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16439	16439	UNINTERRUPTIBLE POWER SYSTEM (UPS)
16511	16511	AUTOMATIC TRANSFER AND BY-PASS/ISOLATION
16512	16511	AUTOMATIC TRANSFER AND BY-PASS/ISOLATION
16513	16513	MOTOR GENERATOR SETS
16610	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16610	16610	LUMINAIRES
16611	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16611	16610	LUMINAIRES
16612	16610	LUMINAIRES
16613	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16613	16610	LUMINAIRES

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16614	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16614	16610	LUMINAIRES
16615	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16615	16610	LUMINAIRES
16616	16610	LUMINAIRES
16616	16616	STREET AND AREA LIGHTING CONTROLS
16617	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16622	16610	LUMINAIRES
16625	16032	WIRING SYSTEMS EQUIPMENT
16631	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16631	16610	LUMINAIRES
16645	16610	LUMINAIRES
16660	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16661	16610	LUMINAIRES
16680	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16682	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16683	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16684	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16688	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16711	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16712	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16813	16233	CLOCK AND PROGRAM SYSTEMS
16814	16814	TELEPHONE SYSTEM, OUTSIDE PLANT
16820	16820	CATHODIC PROTECTION SYSTEM FOR UNDERGROU
16820	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
16821	16820	CATHODIC PROTECTION SYSTEM FOR UNDERGROU
16821	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
16822	16825	FIRE ALARM AND DETECTION EQUIPMENT
16823	16825	FIRE ALARM AND DETECTION EQUIPMENT
16824	16825	FIRE ALARM AND DETECTION EQUIPMENT
16825	16825	FIRE ALARM AND DETECTION EQUIPMENT
16830	15830	RADIATORS
16830	16830	ELECTRIC UNIT HEATERS
16838	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16839	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16840	16840	LIGHTNING ARRESTERS
16845	16845	NURSE CALL SYSTEM
16850	16850	PUBLIC ADDRESS EQUIPMENT
16855	16850	PUBLIC ADDRESS EQUIPMENT
16860	16860	MASTER ANTENNA TELEVISION SYSTEM
16862	16860	MASTER ANTENNA TELEVISION SYSTEM
16865	16860	MASTER ANTENNA TELEVISION SYSTEM
16900	14570	.NULL.
16916	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16917	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16917	16917	ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR
16918	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16919	16840	LIGHTNING ARRESTERS
16921	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16921	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16922	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16922	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16923	16900	POLES FOR STREET AND AREA LIGHTING SYSTE



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16924	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16925	16917	ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR
16925	16925	HIGH-VOLTAGE DISCONNECTING DEVICES
16926	16610	LUMINAIRES

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CROSS REFERENCE ORDERED BY SPECIFICATION SECTION

SECTION_U	SECTION_S	DESC
02010	02012	STANDARD PENETRATION TESTS
02012	02012	STANDARD PENETRATION TESTS
02087	02080	ASBESTOS REMOVAL AND DISPOSAL
02109	02110	CLEARING AND GRUBBING
02215	02211	ROCK REMOVAL
02228	02211	ROCK REMOVAL
02230	02211	ROCK REMOVAL
02240	02211	ROCK REMOVAL
02220	02220	SITE EXCAVATION AND FILL
02223	02220	SITE EXCAVATION AND FILL
02226	02220	SITE EXCAVATION AND FILL
02227	02220	SITE EXCAVATION AND FILL
02230	02220	SITE EXCAVATION AND FILL
02231	02220	SITE EXCAVATION AND FILL
02215	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02228	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02230	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02240	02221	EXCAVATION, TRENCHING, AND BACKFILLING
02216	02222	STRUCTURAL EXCAVATION
02235	02224	PIPE SLEEVES FOR UTILITY LINES
01418	02227	FIELD TESTS
02231	02227	FIELD TESTS
02240	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02250	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02704	02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRA
02241	02243	SOIL STABILIZATION - HYDRATED LIME
02250	02243	SOIL STABILIZATION - HYDRATED LIME
02704	02243	SOIL STABILIZATION - HYDRATED LIME
02243	02250	SOIL STABILIZATION - VIBROFLOTATION
02252	02250	SOIL STABILIZATION - VIBROFLOTATION
02704	02250	SOIL STABILIZATION - VIBROFLOTATION
02244	02251	SOIL STERILIZATION
02250	02251	SOIL STERILIZATION
02270	02272	GABIONS
02270	02274	RIPRAP
02266	02275	SOIL - CEMENT SURFACING
02422	02450	RAILROADS
02704	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02709	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02710	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02712	02511	PORTLAND CEMENT CONCRETE OVERLAYS
02511	02512	STEEL REINFORCED PORTLAND CEMENT
02511	02513	FIBROUS REINFORCED PORTLAND CEMENT
02546	02514	ASPHALTIC CONCRETE OVERLAYS
02243	02515	CRUSHED STONE PAVING
02514	02520	PORTLAND CEMENT CONCRETE SIDEWALKS
02514	02521	ASPHALT CONCRETE SIDEWALKS
02514	02522	MISCELLANEOUS SIDEWALKS



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02514	02523	PRECAST SIDEWALKS AND PAVERS
02525	02525	CONCRETE CURBS AND GUTTERS
02546	02570	PORTLAND CEMENT CONCRETE
02244	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02250	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02546	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02580	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02840	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02841	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02842	02575	BRIDGE DECK ASPHALT CONCRETE WEARING SUR
02546	02576	CRACK SEALING OF ASPHALT CONCRETE PAVEME
02546	02577	PATCHING OF ASPHALT CONCRETE PAVEMENTS
02250	02578	SPRAY APPLICATIONS, SEAL COATS
02546	02579	SLURRY SEALS
02580	02590	PAVEMENT MARKINGS
02644	02661	WATER LINES
02658	02661	WATER LINES
02664	02661	WATER LINES
02762	02661	WATER LINES
13205	02665	WATER RESERVOIRS AND TANKS
13205	02665	WATER RESERVOIRS AND TANKS
13210	02665	WATER RESERVOIRS AND TANKS
13210	02665	WATER RESERVOIRS AND TANKS
02663	02666	CHILLED WATER LINES
02580	02670	WELL REPAIR
02674	02672	WATER WELLS
02684	02685	GAS DISTRIBUTION LINES
02688	02685	GAS DISTRIBUTION LINES
02511	02710	FOUNDATION DRAINAGE SYSTEMS
02667	02710	FOUNDATION DRAINAGE SYSTEMS
02704	02710	FOUNDATION DRAINAGE SYSTEMS
02766	02710	FOUNDATION DRAINAGE SYSTEMS
02772	02710	FOUNDATION DRAINAGE SYSTEMS
13156	02710	FOUNDATION DRAINAGE SYSTEMS
02512	02712	UNDERSLAB DRAINAGE
02704	02712	UNDERSLAB DRAINAGE
13156	02717	.NULL.
02752	02720	STORM DRAINS
02764	02720	STORM DRAINS
02661	02724	FORCE MAINS AND INVERTED SIPHONS
02531	02725	SAND DRAINS
02752	02725	SAND DRAINS
02752	02726	WASTEWATER COLLECTION
02266	02727	EROSION CONTROL
02752	02730	SEWER LINE MANHOLES
02752	02740	SEPTIC TANKS AND GREASE TRAPS
02776	02742	SIPHON TANK AND SIPHONS
15228	02744	GREASE INTERCEPTORS
02267	02745	IMHOFF TANKS
02545	02745	IMHOFF TANKS
02752	02766	SEWER LINE PIPE LINING
02710	02830	FENCES AND GATES
02836	02830	FENCES AND GATES
02831	02831	STEEL CHAIN-LINK FENCING

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02712	02832	STEEL ROD AND BAR FENCING
02834	02832	STEEL ROD AND BAR FENCING
02712	02833	WROUGHT IRON ROD AND BAR FENCING
02834	02833	WROUGHT IRON ROD AND BAR FENCING
02710	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02836	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02841	02834	PRE-CAST CONCRETE AND MASONRY FENCING
02836	02835	PERMANENT WOOD FENCING
02712	02837	FARM-TYPE WIRE FENCING
02834	02837	FARM-TYPE WIRE FENCING
02842	02850	TRAFFIC SIGNS
02531	02860	PLAYING FIELDS
02863	02861	RECREATIONAL FACILITIES
02241	02921	TOPSOIL
02932	02933	SODDING AND SEEDING
02933	02933	SODDING AND SEEDING
02911	02950	PLANTINGS
03114	03105	CONCRETE FORMWORK
03116	03105	CONCRETE FORMWORK
03118	03105	CONCRETE FORMWORK
03126	03105	CONCRETE FORMWORK
03138	03105	CONCRETE FORMWORK
03142	03105	CONCRETE FORMWORK
03146	03105	CONCRETE FORMWORK
03150	03105	CONCRETE FORMWORK
03154	03105	CONCRETE FORMWORK
03158	03105	CONCRETE FORMWORK
03162	03105	CONCRETE FORMWORK
03170	03105	CONCRETE FORMWORK
03174	03105	CONCRETE FORMWORK
03182	03105	CONCRETE FORMWORK
03196	03105	CONCRETE FORMWORK
03132	03130	CONCRETE ACCESSORIES
03133	03130	CONCRETE ACCESSORIES
03198	03130	CONCRETE ACCESSORIES
03217	03205	CONCRETE REINFORCEMENT
03219	03205	CONCRETE REINFORCEMENT
03227	03205	CONCRETE REINFORCEMENT
03228	03205	CONCRETE REINFORCEMENT
03227	03227	STEEL STRESSING TENDONS FOR PRESTRESSED
03311	03305	CAST-IN-PLACE CONCRETE
03314	03305	CAST-IN-PLACE CONCRETE
03318	03305	CAST-IN-PLACE CONCRETE
03326	03305	CAST-IN-PLACE CONCRETE
03396	03305	CAST-IN-PLACE CONCRETE
03398	03305	CAST-IN-PLACE CONCRETE
03334	03334	CONCRETE CURING
03356	03356	GROUT
03362	03362	SHOTCRETE
03372	03372	SPECIALLY PLACED CONCRETE
03399	03399	ROLLER-COMPACTED CONCRETE
03411	03405	PRECAST ARCHITECTURAL CONCRETE
03414	03405	PRECAST ARCHITECTURAL CONCRETE



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03454	03405	PRECAST ARCHITECTURAL CONCRETE
03474	03405	PRECAST ARCHITECTURAL CONCRETE
03490	03405	PRECAST ARCHITECTURAL CONCRETE
03404	03415	PRECAST-PRESTRESSED CONCRETE
03411	03415	PRECAST-PRESTRESSED CONCRETE
03412	03415	PRECAST-PRESTRESSED CONCRETE
03414	03415	PRECAST-PRESTRESSED CONCRETE
03440	03415	PRECAST-PRESTRESSED CONCRETE
03455	03415	PRECAST-PRESTRESSED CONCRETE
03474	03415	PRECAST-PRESTRESSED CONCRETE
03482	03415	PRECAST-PRESTRESSED CONCRETE
03490	03415	PRECAST-PRESTRESSED CONCRETE
03491	03415	PRECAST-PRESTRESSED CONCRETE
03522	03415	PRECAST-PRESTRESSED CONCRETE
03524	03415	PRECAST-PRESTRESSED CONCRETE
03414	03425	MISCELLANEOUS PRECAST ITEMS
03490	03425	MISCELLANEOUS PRECAST ITEMS
03436	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03510	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03520	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03526	03505	PRECAST LIGHTWEIGHT ROOF SLABS
03510	03510	GYP SUM CONCRETE DECKS
03510	03530	CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEM
03536	03530	CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEM
03368	03705	CONCRETE RESTORATION AND CLEANING
03720	03705	CONCRETE RESTORATION AND CLEANING
03730	03705	CONCRETE RESTORATION AND CLEANING
03396	03730	CONCRETE TOPPING
03740	03730	CONCRETE TOPPING
04150	04150	.NULL.
04190	04190	SCAFFOLDING - TUBULAR STEEL
04110	04202	UNIT MASONRY
04116	04202	UNIT MASONRY
04210	04202	UNIT MASONRY
04220	04202	UNIT MASONRY
04232	04202	UNIT MASONRY
04235	04202	UNIT MASONRY
04237	04202	UNIT MASONRY
04240	04202	UNIT MASONRY
04245	04202	UNIT MASONRY
04248	04202	UNIT MASONRY
04251	04202	UNIT MASONRY
04253	04202	UNIT MASONRY
04255	04202	UNIT MASONRY
04270	04202	UNIT MASONRY
04550	04202	UNIT MASONRY
10185	04202	UNIT MASONRY
04110	04210	BRICKWORK
04116	04210	BRICKWORK
04150	04210	BRICKWORK
04210	04210	BRICKWORK
04225	04210	BRICKWORK
04259	04210	BRICKWORK
04520	04210	BRICKWORK

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



04110	04250	TERRA COTTA
04116	04250	TERRA COTTA
04240	04250	TERRA COTTA
04251	04250	TERRA COTTA
04150	04405	STONework
04411	04405	STONework
04422	04405	STONework
04423	04405	STONework
04424	04405	STONework
04426	04405	STONework
04450	04405	STONework
04429	04510	MASONRY RESTORATION
04510	04510	MASONRY RESTORATION
04520	04510	MASONRY RESTORATION
04150	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05020	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05108	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05155	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
06056	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
10260	05020	ANCHOR BOLTS AND EXPANSION ANCHORS
05075	05120	STRUCTURAL STEEL
05120	05120	STRUCTURAL STEEL
05125	05120	STRUCTURAL STEEL
05130	05120	STRUCTURAL STEEL
05132	05120	STRUCTURAL STEEL
05134	05120	STRUCTURAL STEEL
05140	05120	STRUCTURAL STEEL
05150	05120	STRUCTURAL STEEL
05155	05120	STRUCTURAL STEEL
05130	05130	STEEL DECK
05134	05130	STEEL DECK
05314	05130	STEEL DECK
05155	05155	STEEL JOISTS
05210	05155	STEEL JOISTS
05180	05180	MISCELLANEOUS STANDARD METAL ARTICLES
05560	05180	MISCELLANEOUS STANDARD METAL ARTICLES
05155	05210	STEEL TRUSSES
05210	05210	STEEL TRUSSES
05120	05518	PIPE AND TUBE RAILINGS
05518	05518	PIPE AND TUBE RAILINGS
11940	05518	PIPE AND TUBE RAILINGS
05511	05520	METAL STAIRS
05512	05520	METAL STAIRS
05520	05520	METAL STAIRS
05528	05520	METAL STAIRS
11940	05520	METAL STAIRS
05120	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05520	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05528	05528	ORNAMENTAL HANDRAIL AND RAILINGS
10275	05528	ORNAMENTAL HANDRAIL AND RAILINGS
05130	05530	GRATING
05534	05530	GRATING
05542	05530	GRATING



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

05546	05530	GRATING
11024	05530	GRATING
05547	05540	CASTINGS
05178	05556	ORNAMENTAL SHEET METAL
05528	05556	ORNAMENTAL SHEET METAL
05556	05556	ORNAMENTAL SHEET METAL
05561	05556	ORNAMENTAL SHEET METAL
10214	05556	ORNAMENTAL SHEET METAL
11024	05556	ORNAMENTAL SHEET METAL
05814	05814	EXPANSION JOINT COVERS
05911	05910	WATER TREATMENT PLANT DEBRIS RACKS
05912	05910	WATER TREATMENT PLANT DEBRIS RACKS
05913	05910	WATER TREATMENT PLANT DEBRIS RACKS
05914	05910	WATER TREATMENT PLANT DEBRIS RACKS
05915	05910	WATER TREATMENT PLANT DEBRIS RACKS
06056	06056	TIMBER BRIDGE COMPONENTS
06056	06116	LIGHT WOODEN STRUCTURES FRAMING
06103	06116	LIGHT WOODEN STRUCTURES FRAMING
06116	06116	LIGHT WOODEN STRUCTURES FRAMING
06128	06116	LIGHT WOODEN STRUCTURES FRAMING
06190	06116	LIGHT WOODEN STRUCTURES FRAMING
06312	06116	LIGHT WOODEN STRUCTURES FRAMING
06140	06140	SHEATHING, SIDING, AND SUBFLOORING
06154	06140	SHEATHING, SIDING, AND SUBFLOORING
06164	06140	SHEATHING, SIDING, AND SUBFLOORING
06168	06140	SHEATHING, SIDING, AND SUBFLOORING
06182	06140	SHEATHING, SIDING, AND SUBFLOORING
06056	06181	WOOD TRUSSES
06116	06181	WOOD TRUSSES
06181	06181	WOOD TRUSSES
06190	06181	WOOD TRUSSES
06222	06220	MILLWORK
06226	06220	MILLWORK
06227	06220	MILLWORK
06230	06220	MILLWORK
06438	06220	MILLWORK
11940	06220	MILLWORK
06240	06240	CABINETS
06402	06240	CABINETS
06251	06250	WOOD PANELING
06255	06250	WOOD PANELING
06514	06514	.NULL.
06518	06610	.NULL.
06610	06610	.NULL.
07115	07110	BITUMINOUS WATERPROOFING
07112	07111	BITUMINOUS MEMBRANE WATERPROOFING
07115	07111	BITUMINOUS MEMBRANE WATERPROOFING
07110	07115	PLASTIC SHEET WATERPROOFING
07112	07115	PLASTIC SHEET WATERPROOFING
07114	07120	FLUID-APPLIED WATERPROOFING
07120	07120	FLUID-APPLIED WATERPROOFING
07146	07125	METAL WATERPROOFING
07131	07130	BENTONITE CLAY WATERPROOFING
07162	07160	BITUMINOUS DAMPPROOFING

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



07174	07170	SILICONE DAMPPROOFING
07182	07180	CEMENTITIOUS DAMPPROOFING
07112	07198	PLASTIC SHEET VAPOR BARRIERS
07210	07210	BATT AND BLANKET BUILDING INSULATION
07218	07210	BATT AND BLANKET BUILDING INSULATION
07242	07210	BATT AND BLANKET BUILDING INSULATION
13112	07210	BATT AND BLANKET BUILDING INSULATION
07202	07211	LOOSE OR GRANULAR FILL INSULATION
07210	07211	LOOSE OR GRANULAR FILL INSULATION
07218	07211	LOOSE OR GRANULAR FILL INSULATION
07210	07212	RIGID INSULATION
07216	07212	RIGID INSULATION
07218	07212	RIGID INSULATION
07223	07213	PERIMETER INSULATION
07215	07215	SPRAYED-ON INSULATION
07223	07223	ROOF INSULATION AND UNDERLAYMENT
07240	07223	ROOF INSULATION AND UNDERLAYMENT
07223	07224	ROOF INSULATION AND UNDERLAYMENT
07240	07224	ROOF INSULATION AND UNDERLAYMENT
07223	07225	ROOF INSULATION AND UNDERLAYMENT
07240	07225	ROOF INSULATION AND UNDERLAYMENT
07223	07226	ROOF INSULATION AND UNDERLAYMENT
07240	07226	ROOF INSULATION AND UNDERLAYMENT
07223	07227	ROOF INSULATION AND UNDERLAYMENT
07240	07227	ROOF INSULATION AND UNDERLAYMENT
07254	07256	SPRAYED-ON FIREPROOFING
07314	07314	SLATE SHINGLES
07322	07321	CLAY ROOFING TILES
07411	07410	PREFORMED ROOFING AND SIDING
07424	07410	PREFORMED ROOFING AND SIDING
07511	07463	ASBESTOS CEMENT ROOFING AND SIDING
07511	07510	BUILT-UP ROOFING
07515	07510	BUILT-UP ROOFING
07511	07530	SINGLE PLY ROOFING
07531	07530	SINGLE PLY ROOFING
07512	07550	INVERTED ROOF SYSTEMS
07511	07573	COMPOSITION TRAFFIC TOPPING
07411	07605	SHEET METAL
07621	07605	SHEET METAL
07622	07605	SHEET METAL
07624	07605	SHEET METAL
07625	07605	SHEET METAL
07717	07605	SHEET METAL
07729	07605	SHEET METAL
10350	07620	.NULL.
10355	07620	.NULL.
07726	07705	ROOF ACCESSORIES
15754	07705	ROOF ACCESSORIES
07811	07811	PLASTIC SKYLIGHTS
07822	07812	METAL-FRAMED SKYLIGHTS
07924	07920	SEALANTS
10355	07920	SEALANTS
08109	08110	HOLLOW METAL DOORS AND FRAMES



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

08114	08110	HOLLOW METAL DOORS AND FRAMES
08115	08110	HOLLOW METAL DOORS AND FRAMES
08116	08110	HOLLOW METAL DOORS AND FRAMES
08118	08110	HOLLOW METAL DOORS AND FRAMES
08119	08110	HOLLOW METAL DOORS AND FRAMES
08305	08110	HOLLOW METAL DOORS AND FRAMES
08115	08115	ALUMINUM DOORS AND FRAMES
08220	08220	WOOD DOORS AND FRAMES
08254	08220	WOOD DOORS AND FRAMES
08262	08220	WOOD DOORS AND FRAMES
08266	08220	WOOD DOORS AND FRAMES
08270	08220	WOOD DOORS AND FRAMES
08278	08220	WOOD DOORS AND FRAMES
08279	08220	WOOD DOORS AND FRAMES
08278	08278	.NULL.
08312	08312	ALUMINUM AND WOOD SLIDING GLASS DOORS
08316	08316	SLIDING FIRE DOORS
08317	08317	SECURITY VAULT DOORS
08332	08330	COILING (ROLLING) DOORS
08342	08330	COILING (ROLLING) DOORS
08369	08330	COILING (ROLLING) DOORS
08376	08330	COILING (ROLLING) DOORS
08356	08356	FLEXIBLE DOORS
08361	08360	OVERHEAD DOORS
08362	08360	OVERHEAD DOORS
08365	08360	OVERHEAD DOORS
08278	08379	WOOD SAFETY GLASS DOORS
08379	08379	WOOD SAFETY GLASS DOORS
08385	08385	SOUND RETARDANT DOORS
08278	08390	SCREEN AND STORM DOORS
08390	08390	SCREEN AND STORM DOORS
08394	08390	SCREEN AND STORM DOORS
08413	08410	ENTRANCES
08415	08410	ENTRANCES
08417	08410	ENTRANCES
08471	08471	REVOLVING DOORS
08512	08512	METAL WINDOWS
10535	08512	METAL WINDOWS
08520	08520	ALUMINUM WINDOWS
08524	08520	ALUMINUM WINDOWS
10535	08520	ALUMINUM WINDOWS
08604	08610	WOOD WINDOWS
08610	08610	WOOD WINDOWS
08620	08610	WOOD WINDOWS
08624	08610	WOOD WINDOWS
08632	08610	WOOD WINDOWS
08640	08610	WOOD WINDOWS
08704	08710	FINISH HARDWARE
08708	08710	FINISH HARDWARE
08709	08710	FINISH HARDWARE
08710	08710	FINISH HARDWARE
08713	08710	FINISH HARDWARE
08714	08710	FINISH HARDWARE
08715	08710	FINISH HARDWARE

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



08716	08710	FINISH HARDWARE
08717	08710	FINISH HARDWARE
08718	08710	FINISH HARDWARE
08719	08710	FINISH HARDWARE
08726	08710	FINISH HARDWARE
08728	08710	FINISH HARDWARE
08729	08710	FINISH HARDWARE
08734	08710	FINISH HARDWARE
08754	08710	FINISH HARDWARE
10183	08710	FINISH HARDWARE
10605	08710	FINISH HARDWARE
10615	08710	FINISH HARDWARE
08278	08800	GLASS AND GLAZING
08755	08800	GLASS AND GLAZING
08818	08800	GLASS AND GLAZING
08820	08800	GLASS AND GLAZING
08832	08800	GLASS AND GLAZING
08836	08800	GLASS AND GLAZING
08844	08800	GLASS AND GLAZING
08852	08800	GLASS AND GLAZING
08855	08800	GLASS AND GLAZING
08862	08800	GLASS AND GLAZING
08872	08800	GLASS AND GLAZING
08876	08800	GLASS AND GLAZING
08884	08800	GLASS AND GLAZING
08894	08800	GLASS AND GLAZING
08895	08800	GLASS AND GLAZING
08415	08915	ALUMINUM WINDOW WALLS/CURTAIN WALLS
08924	08915	ALUMINUM WINDOW WALLS/CURTAIN WALLS
09134	09210	PLASTER REPAIRS
09200	09210	PLASTER REPAIRS
09203	09210	PLASTER REPAIRS
09211	09210	PLASTER REPAIRS
09213	09210	PLASTER REPAIRS
09263	09210	PLASTER REPAIRS
09312	09315	TILE FLOORING
09334	09315	TILE FLOORING
09340	09315	TILE FLOORING
09312	09320	CERAMIC WALL TILE
09400	09405	TERRAZZO
09414	09405	TERRAZZO
09421	09405	TERRAZZO
09721	09405	TERRAZZO
10185	09405	TERRAZZO
09134	09510	ACOUSTICAL CEILINGS
09510	09510	ACOUSTICAL CEILINGS
09512	09510	ACOUSTICAL CEILINGS
09514	09510	ACOUSTICAL CEILINGS
09519	09510	ACOUSTICAL CEILINGS
09534	09530	ACOUSTICAL INSULATION AND BARRIERS
09526	09535	SOUND ABSORBING PANELS
09564	09560	WOOD STRIP FLOORING
09565	09566	WOOD BLOCK INDUSTRIAL FLOORING



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

09564	09570	WOOD PARQUET FLOORING
09564	09596	GYMNASIUM FLOORING
09664	09651	RESILIENT FLOORING - CEMENTITIOUS UNDERL
09661	09655	RESILIENT FLOORING
09721	09670	FLUID-APPLIED RESILIENT FLOORING
09661	09675	CONDUCTIVE VINYL TILE FLOORING
09682	09685	CARPETING
09691	09685	CARPETING
09721	09720	EPOXY FLOORING
09721	09731	CONDUCTIVE ELASTOMERIC LIQUID FLOORING
09634	09750	BRICK FLOORING
09634	09751	LIGHT-DUTY BRICK FLOORING
09910	09910	EXTERIOR PAINTING
09920	09920	INTERIOR PAINTING
05155	09941	PAINTING OF WATER STORAGE TANK
09960	09952	WALL COVERINGS
09970	09952	WALL COVERINGS
10266	09952	WALL COVERINGS
10050	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10160	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10185	10160	COMPARTMENTS AND CUBICLES FOR SHOWER AND
10275	10275	ACCESS AND PEDESTAL FLOORS
10350	10350	.NULL.
10350	10351	FLAGPOLES
10355	10351	FLAGPOLES
10410	10410	DIRECTORY AND BULLETIN BOARDS
10410	10412	.NULL.
10430	10430	SIGNS
10451	10451	.NULL.
10451	10452	SECURITY SCREENS
10505	10505	METAL LOCKERS
10520	10520	FIRE EXTINGUISHERS, CABINETS, AND ACCESS
10183	10550	POSTAL SPECIALTIES
10551	10550	POSTAL SPECIALTIES
10553	10550	POSTAL SPECIALTIES
10260	10605	WIRE MESH PARTITIONS
10505	10605	WIRE MESH PARTITIONS
10605	10605	WIRE MESH PARTITIONS
10615	10615	DEMOUNTABLE PARTITIONS
10050	10630	MOVABLE METAL PARTITIONS
10630	10630	MOVABLE METAL PARTITIONS
10677	10677	METAL STORAGE SHELVING
11169	10677	METAL STORAGE SHELVING
10820	10820	TOILET ACCESSORIES
10911	10911	WARDROBES
11024	11024	VAULT DOOR UNITS
11061	11061	THEATER & STAGE EQUIPMENT
11106	11106	REFRIGERATORS
11910	11106	REFRIGERATORS
11132	11132	PROJECTION SCREENS
11150	11150	PARKING CONTROL EQUIPMENT
11161	11160	PLATFORM AND DOCK LIFTS
11161	11161	PLATFORM AND DOCK LEVELERS
11161	11165	PLATFORM AND DOCK BUMPERS

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



11106	11402	FOOD SERVICE EQUIPMENT
11402	11402	FOOD SERVICE EQUIPMENT
11420	11402	FOOD SERVICE EQUIPMENT
11910	11402	FOOD SERVICE EQUIPMENT
11415	11415	UNIT KITCHENS
11910	11415	UNIT KITCHENS
11420	11420	RANGES AND OVENS
11910	11420	RANGES AND OVENS
11484	11484	GYMNASIUM EQUIPMENT
11484	11486	DEMOUNTABLE BLEACHERS (EXTERIOR)
11140	11501	PAINT SPRAY BOOTH
11600	11600	METAL MEDICAL CASEWORK
11700	11600	METAL MEDICAL CASEWORK
11600	11700	LABORATORY AND MEDICAL EQUIPMENT
11700	11700	LABORATORY AND MEDICAL EQUIPMENT
11910	11910	DISHWASHERS
11910	11912	GARBAGE DISPOSERS
11920	11920	CLOTHES DRYERS
11920	11922	CLOTHES WASHERS
11980	11980	TARGET FIRING RANGES (EXTERIOR)
12531	12531	WINDOW TREATMENT HARDWARE
13090	13090	RADIATION PROTECTION
13112	13112	PRE-ENGINEERED STRUCTURES
13153	13151	.NULL.
11024	13800	FLOOR SAFES
13800	13800	FLOOR SAFES
14211	14245	.NULL.
14211	14250	.NULL.
14400	14400	.NULL.
14405	14400	.NULL.
14401	14410	.NULL.
14211	14420	.NULL.
14416	14450	.NULL.
14551	14510	.NULL.
02368	14570	.NULL.
02530	14570	.NULL.
05008	14570	.NULL.
05060	14570	.NULL.
05075	14570	.NULL.
05120	14570	.NULL.
05130	14570	.NULL.
05134	14570	.NULL.
05150	14570	.NULL.
05155	14570	.NULL.
05175	14570	.NULL.
15141	14570	.NULL.
15162	14570	.NULL.
15172	14570	.NULL.
15199	14570	.NULL.
15286	14570	.NULL.
15742	14570	.NULL.
16900	14570	.NULL.
14611	14602	.NULL.



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

14660	14602	.NULL.
14611	14650	ASH HOISTS
02768	15060	MECHANICAL PIPING
11140	15060	MECHANICAL PIPING
15141	15060	MECHANICAL PIPING
15151	15060	MECHANICAL PIPING
15162	15060	MECHANICAL PIPING
15172	15060	MECHANICAL PIPING
15188	15060	MECHANICAL PIPING
15192	15060	MECHANICAL PIPING
15193	15060	MECHANICAL PIPING
15194	15060	MECHANICAL PIPING
02645	15100	VALVES
11402	15100	VALVES
15103	15100	VALVES
15104	15100	VALVES
15109	15100	VALVES
15111	15100	VALVES
15112	15100	VALVES
15115	15100	VALVES
15116	15100	VALVES
15118	15100	VALVES
15121	15100	VALVES
15123	15100	VALVES
15192	15100	VALVES
15193	15100	VALVES
15194	15100	VALVES
15197	15100	VALVES
15199	15100	VALVES
15622	15100	VALVES
15640	15100	VALVES
15742	15100	VALVES
05130	15120	PIPING ACCESSORIES
07624	15120	PIPING ACCESSORIES
15114	15120	PIPING ACCESSORIES
15115	15120	PIPING ACCESSORIES
15162	15120	PIPING ACCESSORIES
15164	15120	PIPING ACCESSORIES
15172	15120	PIPING ACCESSORIES
15174	15120	PIPING ACCESSORIES
15176	15120	PIPING ACCESSORIES
15508	15120	PIPING ACCESSORIES
15510	15120	PIPING ACCESSORIES
15635	15120	PIPING ACCESSORIES
15672	15120	PIPING ACCESSORIES
15698	15120	PIPING ACCESSORIES
11140	15160	PUMPS
15141	15160	PUMPS
15142	15160	PUMPS
15143	15160	PUMPS
15145	15160	PUMPS
15146	15160	PUMPS
15151	15160	PUMPS
15286	15160	PUMPS

Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)



15290	15160	PUMPS
15291	15160	PUMPS
15292	15160	PUMPS
15293	15160	PUMPS
15295	15160	PUMPS
15297	15160	PUMPS
15298	15160	PUMPS
15182	15261	INSULATION FOR ABOVEGROUND PIPE
15188	15261	INSULATION FOR ABOVEGROUND PIPE
15567	15261	INSULATION FOR ABOVEGROUND PIPE
02663	15262	INSULATION FOR UNDERGROUND PIPE
15188	15262	INSULATION FOR UNDERGROUND PIPE
15190	15290	DUCTWORK INSULATION
15567	15290	DUCTWORK INSULATION
10521	15301	FIRE PROTECTION SYSTEMS
10522	15301	FIRE PROTECTION SYSTEMS
15411	15301	FIRE PROTECTION SYSTEMS
15414	15301	FIRE PROTECTION SYSTEMS
15416	15301	FIRE PROTECTION SYSTEMS
15417	15301	FIRE PROTECTION SYSTEMS
15418	15301	FIRE PROTECTION SYSTEMS
15508	15301	FIRE PROTECTION SYSTEMS
15560	15301	FIRE PROTECTION SYSTEMS
10186	15401	INTERIOR PLUMBING
11474	15401	INTERIOR PLUMBING
11475	15401	INTERIOR PLUMBING
15104	15401	INTERIOR PLUMBING
15107	15401	INTERIOR PLUMBING
15109	15401	INTERIOR PLUMBING
15116	15401	INTERIOR PLUMBING
15220	15401	INTERIOR PLUMBING
15306	15401	INTERIOR PLUMBING
15310	15401	INTERIOR PLUMBING
15601	15401	INTERIOR PLUMBING
15731	15401	INTERIOR PLUMBING
13205	15451	STEEL TANKS
13205	15451	STEEL TANKS
13210	15451	STEEL TANKS
13214	15451	STEEL TANKS
13215	15451	STEEL TANKS
15176	15451	STEEL TANKS
13205	15452	PLASTIC TANKS
13205	15452	PLASTIC TANKS
13210	15452	PLASTIC TANKS
13214	15452	PLASTIC TANKS
13154	15475	POOL EQUIPMENT
13155	15475	POOL EQUIPMENT
13156	15475	POOL EQUIPMENT
13158	15475	POOL EQUIPMENT
15152	15481	COMPRESSED AIR EQUIPMENT
15726	15481	COMPRESSED AIR EQUIPMENT
15511	15556	FIRE TUBE BOILERS
15622	15556	FIRE TUBE BOILERS



Job Order Contract Specifications

MEDCOM Support Team, Fort Worth (UPB localized to Fort Lewis - WA)

15513	15557	WATER TUBE BOILERS
15509	15558	HIGH TEMPERATURE WATER BOILERS
15510	15558	HIGH TEMPERATURE WATER BOILERS
15513	15558	HIGH TEMPERATURE WATER BOILERS
15509	15559	CAST-IRON BOILERS AND FIREBOXES
15568	15573	DRAFT CONTROL EQUIPMENT
02517	15576	BREECHING
04225	15576	BREECHING
04227	15576	BREECHING
04260	15576	BREECHING
04554	15576	BREECHING
15569	15576	BREECHING
15569	15577	STACKS
13215	15581	GAS METERS AND REGULATORS
13215	15590	FUEL HANDLING SYSTEMS
15605	15590	FUEL HANDLING SYSTEMS
15287	15610	WARM AIR FURNACES
15542	15610	WARM AIR FURNACES
15720	15610	WARM AIR FURNACES
15728	15670	CONDENSERS
15544	15680	REFRIGERANT EQUIPMENT
15672	15680	REFRIGERANT EQUIPMENT
15690	15680	REFRIGERANT EQUIPMENT
15720	15680	REFRIGERANT EQUIPMENT
15729	15680	REFRIGERANT EQUIPMENT
15635	15683	REFRIGERATION SPECIALTIES
15770	15683	REFRIGERATION SPECIALTIES
15680	15711	NATURAL DRAFT COOLING TOWERS
15730	15711	NATURAL DRAFT COOLING TOWERS
15680	15712	FORCED DRAFT AND INDUCED DRAFT COOLING T
15730	15712	FORCED DRAFT AND INDUCED DRAFT COOLING T
15541	15751	COILS
15723	15751	COILS
15750	15751	COILS
15549	15760	STEAM AND HOT WATER UNIT HEATERS
15547	15781	PACKAGED HEATING AND COOLING UNITS
15710	15781	PACKAGED HEATING AND COOLING UNITS
15717	15781	PACKAGED HEATING AND COOLING UNITS
15721	15781	PACKAGED HEATING AND COOLING UNITS
15713	15782	PACKAGED HEAT PUMPS
11474	15800	HUMIDITY CONTROL EQUIPMENT
15566	15800	HUMIDITY CONTROL EQUIPMENT
15565	15830	RADIATORS
15752	15830	RADIATORS
16830	15830	RADIATORS
08372	15834	.NULL.
15542	15840	INDUCTION UNITS
15708	15855	AIR HANDLING UNITS
15763	15855	AIR HANDLING UNITS
15733	15860	CENTRIFUGAL FANS
08372	15865	AXIAL FLOW FANS
15733	15865	AXIAL FLOW FANS
15733	15871	POWER ROOF VENTILATORS
15754	15871	POWER ROOF VENTILATORS

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15747	15881	DIFFUSERS, REGISTERS, GRILLES, AND LOUVE
15749	15881	DIFFUSERS, REGISTERS, GRILLES, AND LOUVE
15740	15886	AIR CLEANING DEVICES
15764	15886	AIR CLEANING DEVICES
15635	15887	TAILPIPE EXHAUST EQUIPMENT
13093	15890	DUCTWORK AND ACCESSORIES
15567	15890	DUCTWORK AND ACCESSORIES
15751	15890	DUCTWORK AND ACCESSORIES
15751	15915	CONTROL AND FIRE DAMPERS
15890	15920	SOUND ATTENUATORS
13215	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15149	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15640	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15742	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15751	15951	CONTROL DEVICES FOR MECHANICAL EQUIPMENT
15761	15990	TESTING AND BALANCING OF HVAC SYSTEMS
16011	16032	WIRING SYSTEMS EQUIPMENT
16015	16032	WIRING SYSTEMS EQUIPMENT
16017	16032	WIRING SYSTEMS EQUIPMENT
16018	16032	WIRING SYSTEMS EQUIPMENT
16022	16032	WIRING SYSTEMS EQUIPMENT
16024	16032	WIRING SYSTEMS EQUIPMENT
16026	16032	WIRING SYSTEMS EQUIPMENT
16029	16032	WIRING SYSTEMS EQUIPMENT
16032	16032	WIRING SYSTEMS EQUIPMENT
16056	16032	WIRING SYSTEMS EQUIPMENT
16109	16032	WIRING SYSTEMS EQUIPMENT
16113	16032	WIRING SYSTEMS EQUIPMENT
16119	16032	WIRING SYSTEMS EQUIPMENT
16121	16032	WIRING SYSTEMS EQUIPMENT
16122	16032	WIRING SYSTEMS EQUIPMENT
16153	16032	WIRING SYSTEMS EQUIPMENT
16211	16032	WIRING SYSTEMS EQUIPMENT
16213	16032	WIRING SYSTEMS EQUIPMENT
16232	16032	WIRING SYSTEMS EQUIPMENT
16233	16032	WIRING SYSTEMS EQUIPMENT
16234	16032	WIRING SYSTEMS EQUIPMENT
16625	16032	WIRING SYSTEMS EQUIPMENT
16114	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16115	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16117	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16119	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16123	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16153	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16181	16110	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS
16111	16111	FIBER OPTIC DATA TRANSMISSION SYSTEM
16114	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16115	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16117	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16120	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16153	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16711	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST
16712	16115	UNDERGROUND ELECTRICAL DISTRIBUTION SYST



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16121	16121	INSTITUTIONAL ELECTRIC HEATING EQUIPMENT
16123	16123	ELECTRICAL DISTRIBUTION SYSTEM GROUNDING
16181	16123	ELECTRICAL DISTRIBUTION SYSTEM GROUNDING
16233	16233	CLOCK AND PROGRAM SYSTEMS
16813	16233	CLOCK AND PROGRAM SYSTEMS
16315	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16316	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16323	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16324	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16325	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16326	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16328	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16329	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16331	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16332	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16333	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16336	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16337	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16338	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16339	16300	MOTOR CONTROL CENTERS, PANELBOARDS AND L
16313	16313	ELECTRIC MOTORS
16353	16313	ELECTRIC MOTORS
16412	16416	TRANSFORMERS
16416	16416	TRANSFORMERS
16439	16439	UNINTERRUPTIBLE POWER SYSTEM (UPS)
16511	16511	AUTOMATIC TRANSFER AND BY-PASS/ISOLATION
16512	16511	AUTOMATIC TRANSFER AND BY-PASS/ISOLATION
16513	16513	MOTOR GENERATOR SETS
16610	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16611	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16613	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16614	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16615	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
16631	16600	LUMINAIRE BALLASTS AND TRANSFORMERS
10050	16610	LUMINAIRES
16610	16610	LUMINAIRES
16611	16610	LUMINAIRES
16612	16610	LUMINAIRES
16613	16610	LUMINAIRES
16614	16610	LUMINAIRES
16615	16610	LUMINAIRES
16616	16610	LUMINAIRES
16622	16610	LUMINAIRES
16631	16610	LUMINAIRES
16645	16610	LUMINAIRES
16661	16610	LUMINAIRES
16926	16610	LUMINAIRES
16616	16616	STREET AND AREA LIGHTING CONTROLS
13219	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16660	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16838	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16839	16660	CENTRAL MONITORING, CONTROL, AND INSTRUM
16680	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16682	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA

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16683	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16684	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16688	16680	AIRFIELD AND HELIPORT LIGHTING AND VISUA
16122	16814	TELEPHONE SYSTEM, OUTSIDE PLANT
16814	16814	TELEPHONE SYSTEM, OUTSIDE PLANT
16820	16820	CATHODIC PROTECTION SYSTEM FOR UNDERGROU
16821	16820	CATHODIC PROTECTION SYSTEM FOR UNDERGROU
13205	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
13210	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
16820	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
16821	16821	CATHODIC PROTECTION OF STEEL WATER TANKS
16121	16825	FIRE ALARM AND DETECTION EQUIPMENT
16822	16825	FIRE ALARM AND DETECTION EQUIPMENT
16823	16825	FIRE ALARM AND DETECTION EQUIPMENT
16824	16825	FIRE ALARM AND DETECTION EQUIPMENT
16825	16825	FIRE ALARM AND DETECTION EQUIPMENT
11930	16830	ELECTRIC UNIT HEATERS
16830	16830	ELECTRIC UNIT HEATERS
16840	16840	LIGHTNING ARRESTERS
16919	16840	LIGHTNING ARRESTERS
16845	16845	NURSE CALL SYSTEM
16850	16850	PUBLIC ADDRESS EQUIPMENT
16855	16850	PUBLIC ADDRESS EQUIPMENT
16860	16860	MASTER ANTENNA TELEVISION SYSTEM
16862	16860	MASTER ANTENNA TELEVISION SYSTEM
16865	16860	MASTER ANTENNA TELEVISION SYSTEM
16617	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16921	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16922	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16923	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16924	16900	POLES FOR STREET AND AREA LIGHTING SYSTE
16423	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16424	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16427	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16916	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16917	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16918	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16921	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16922	16916	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATIO
16917	16917	ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR
16925	16917	ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR
16340	16925	HIGH-VOLTAGE DISCONNECTING DEVICES
16925	16925	HIGH-VOLTAGE DISCONNECTING DEVICES
02010	19120	DEMOLITION
02011	19120	DEMOLITION
02012	19120	DEMOLITION
02046	19120	DEMOLITION
02049	19120	DEMOLITION
02055	19120	DEMOLITION
02057	19120	DEMOLITION
02058	19120	DEMOLITION
02059	19120	DEMOLITION
02068	19120	DEMOLITION



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02069	19120	DEMOLITION
02070	19120	DEMOLITION
02072	19120	DEMOLITION